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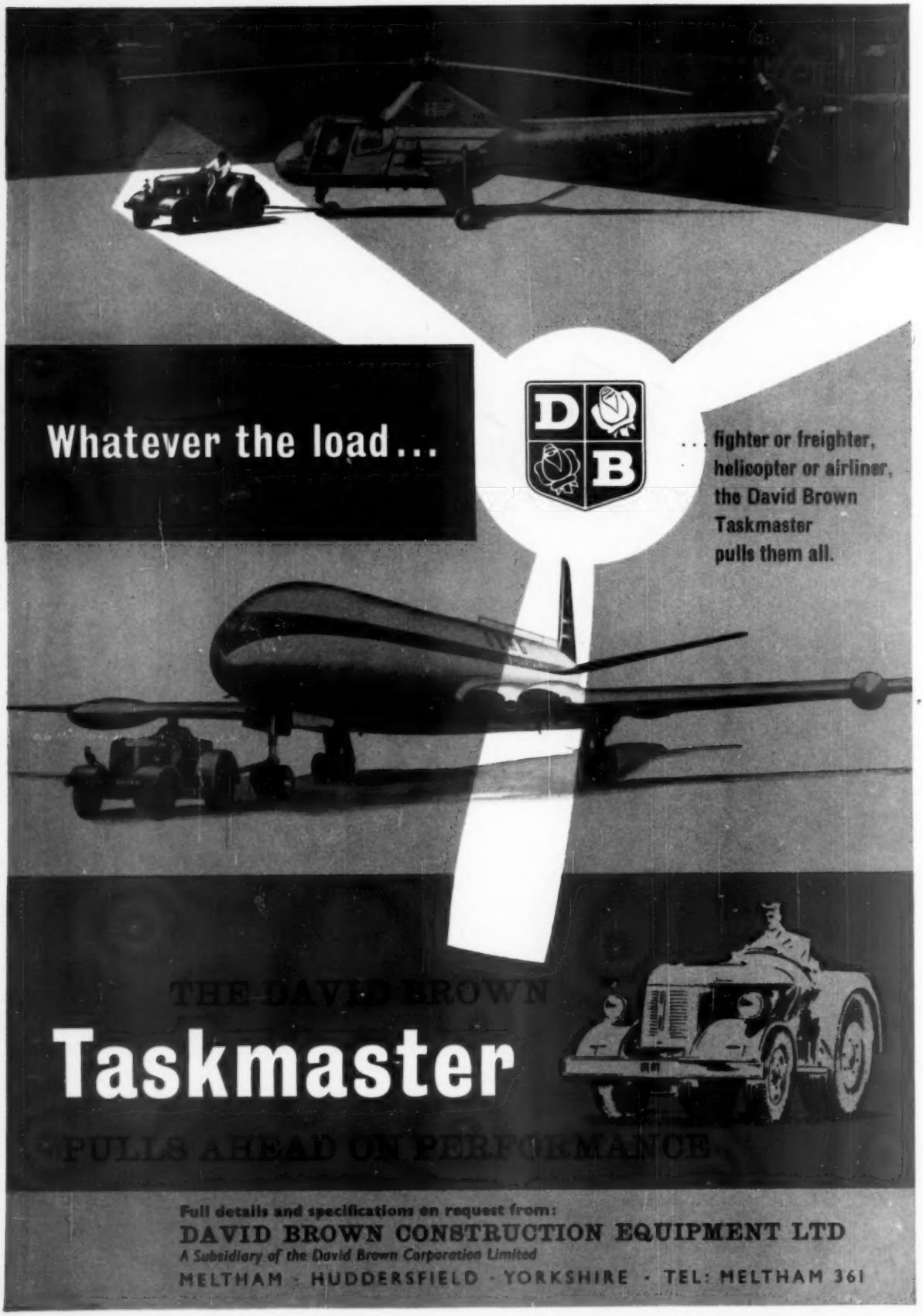
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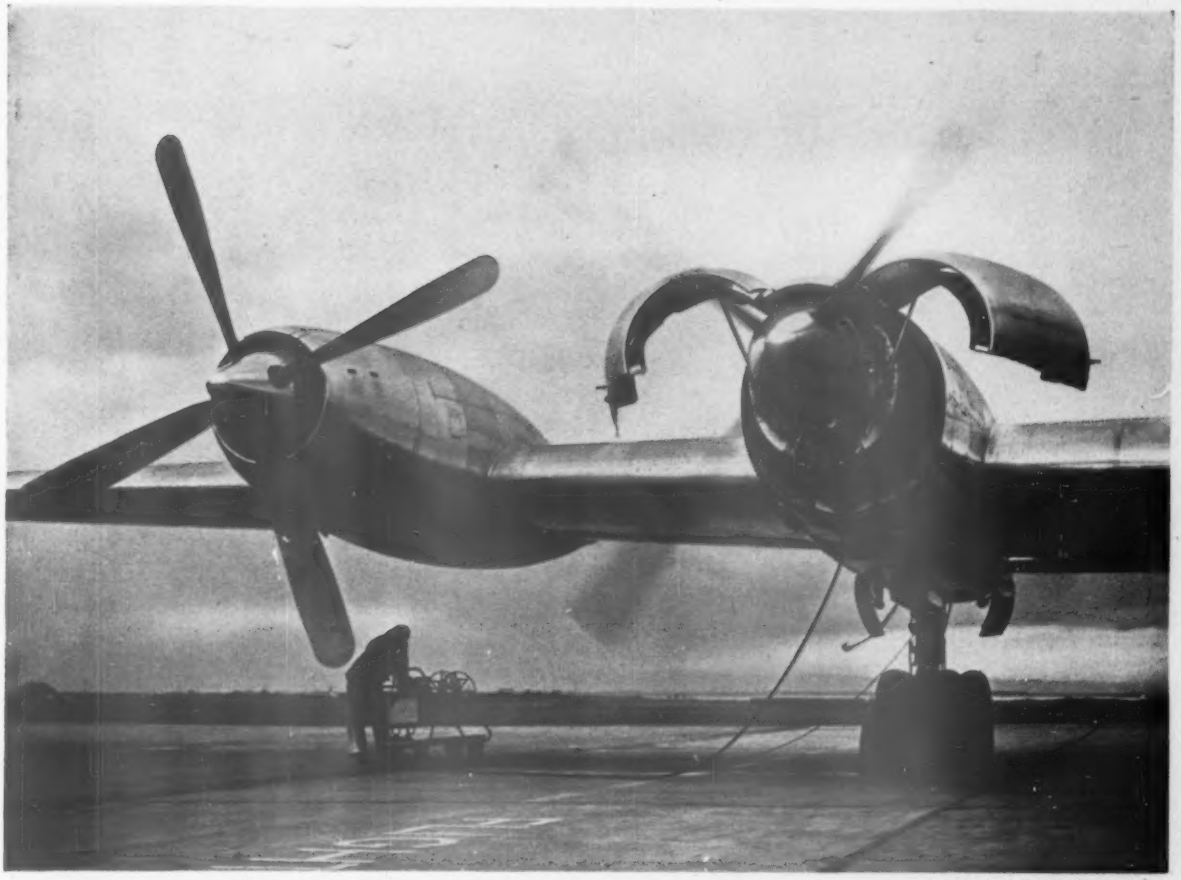

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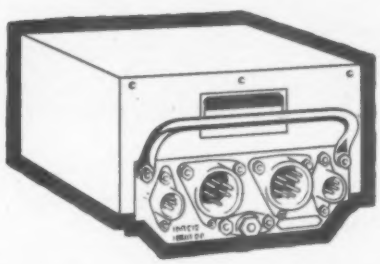

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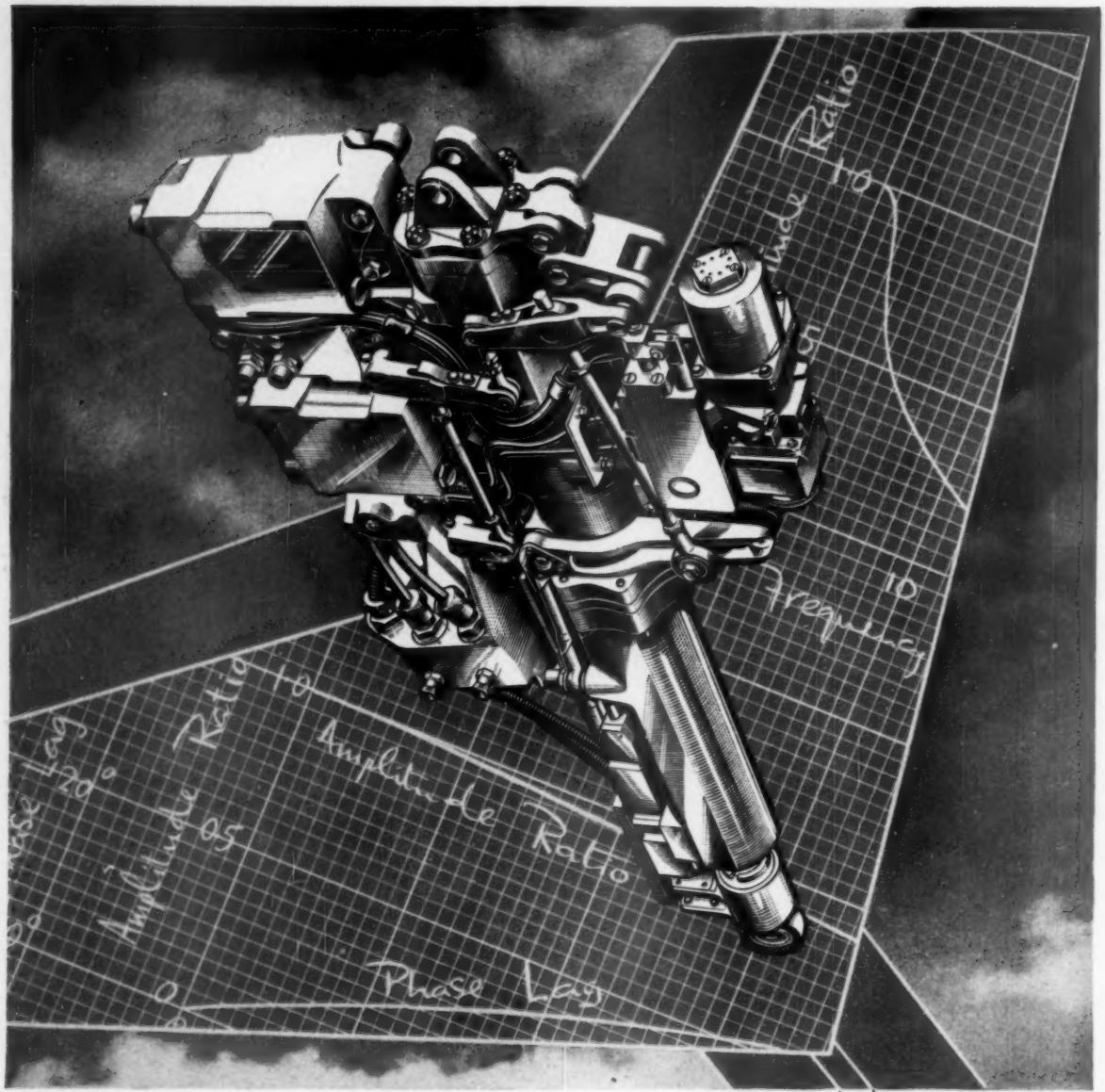

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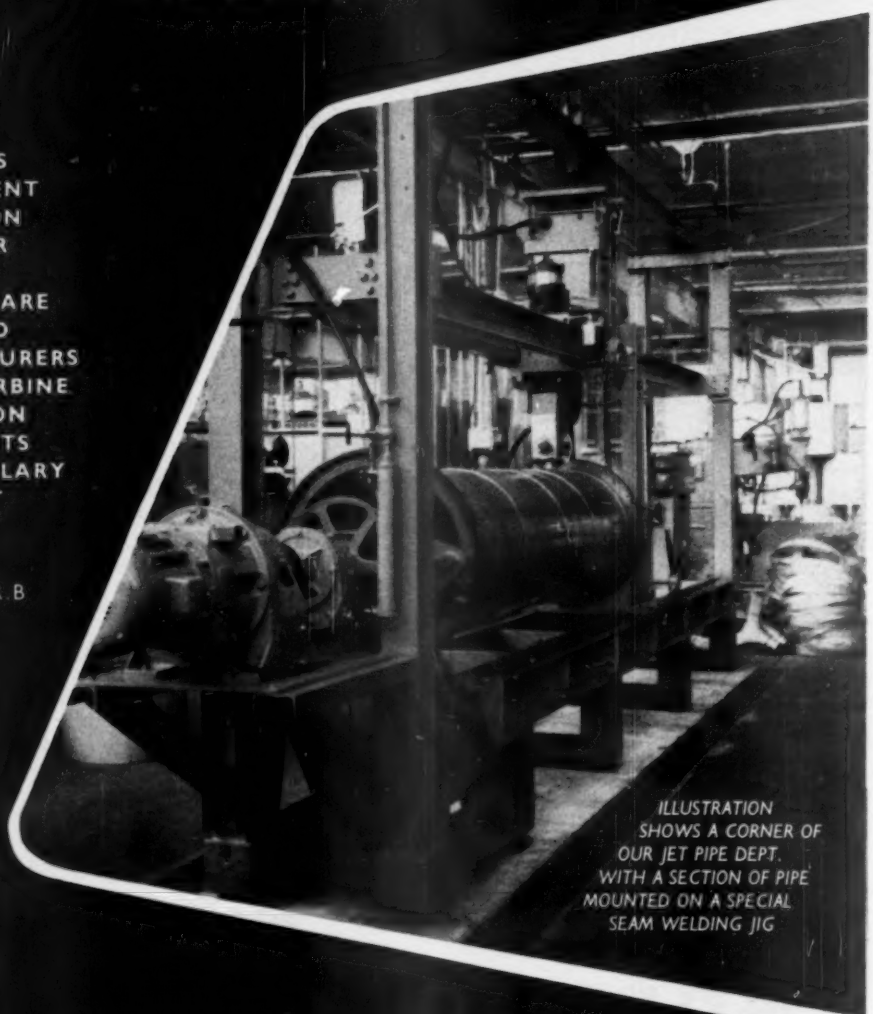

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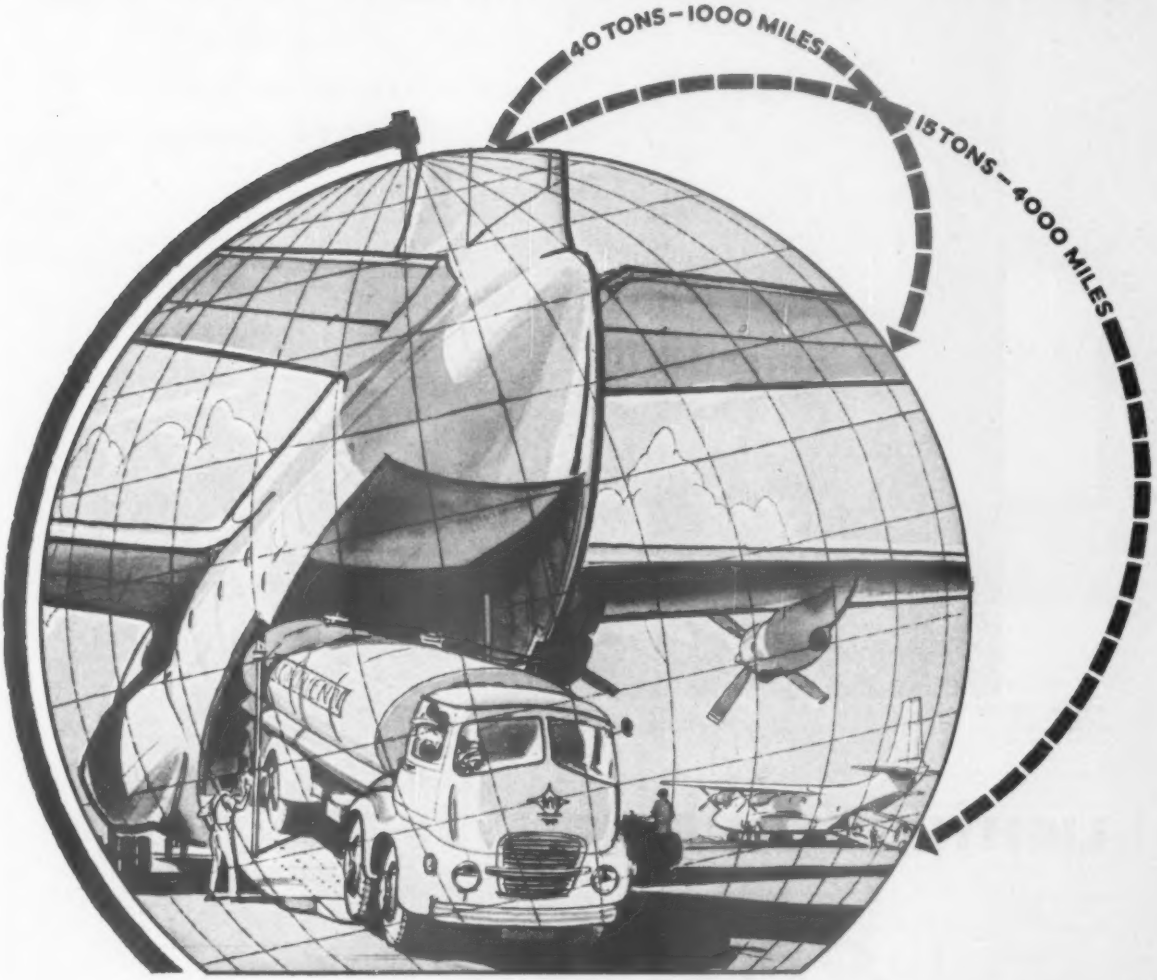

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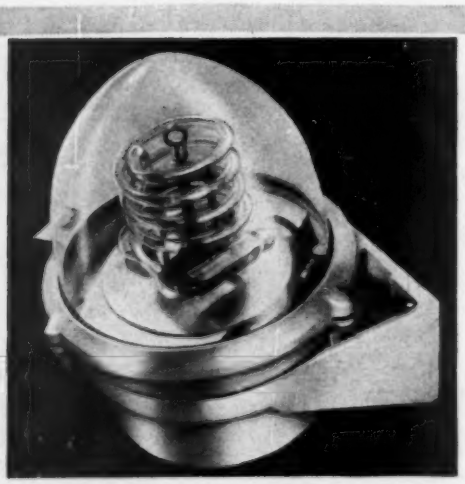

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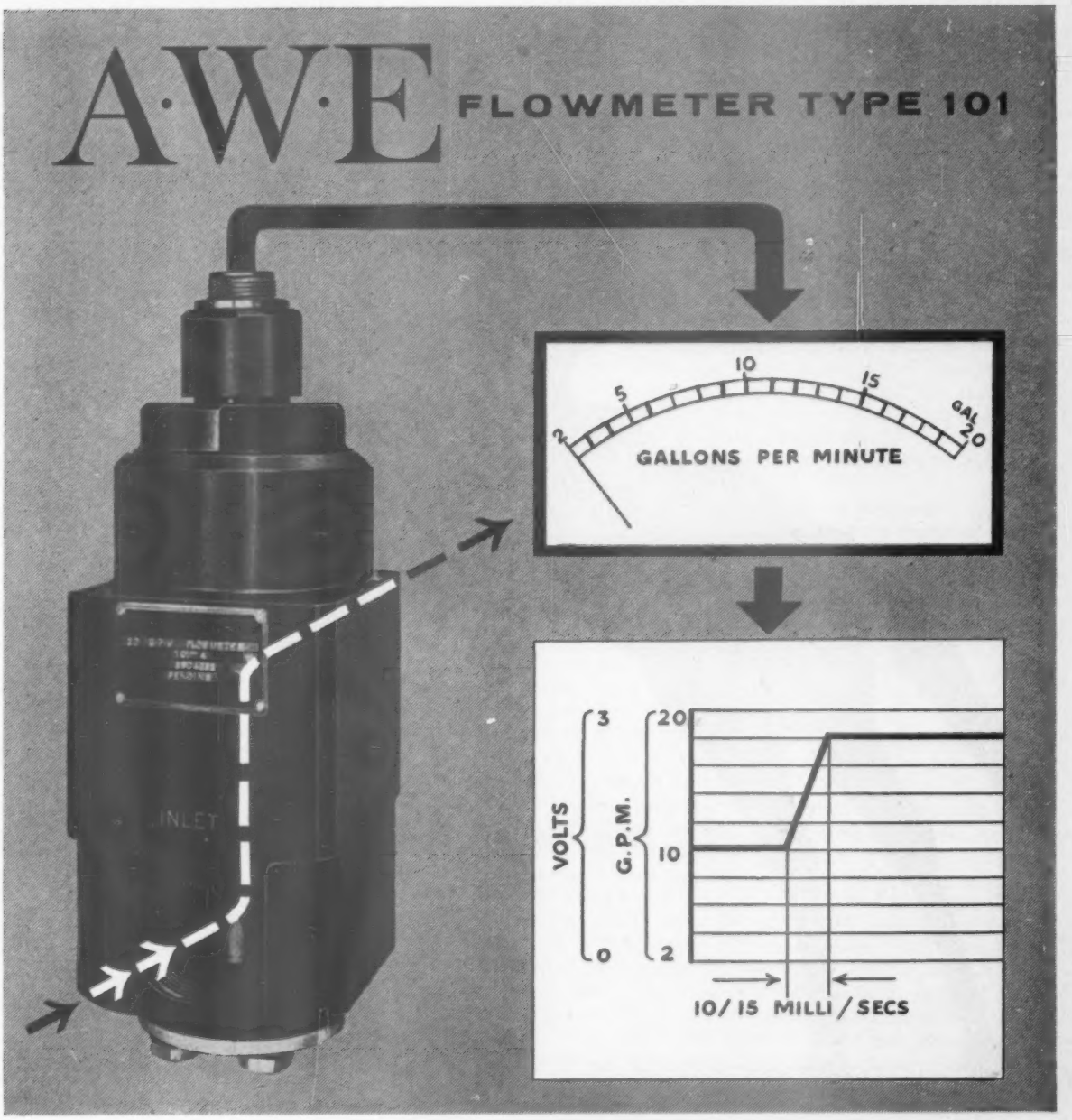

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THE AEROPLANE and ASTRONAUTICS

VOLUME 98 NUMBER 2523 FEBRUARY 26, 1960

Down-to-Earth Research

The Minister of Aviation's statement, in the House of Commons last Monday, concerning the placing of contracts with the major airframe and aero-engine groups for the preparation of studies in relation to the supersonic transport is a reminder that regrouping of the Industry and arranging for Government support in certain well-defined fields are but steps towards an end. The Industry is much better placed than it was to compete in the international airline market; but this is not the time to forget that its success in the past has been based on a steady programme of research at Government level.

In this context let us remind readers that, for some time, visitors returning from the United States have come back much impressed with the single-mindedness with which research in that vast federation has been turned over to space research. Many valuable investigations which promised well for the future of what we might in this context describe as earth-bound aviation had disappeared. This must be a bad thing. However important it is to move around space and go exploring through the solar system, there must be for many years to come a continuing need for steady technical development in the business of aviating in the atmosphere.

We move much more slowly in this country. Indeed there are cynics to be found who declare that movement here is sometimes indistinguishable from remaining stationary. Signs of official recognition can at last be distinguished that the United Kingdom and the Commonwealth ought to do something about getting out into space. There does seem to be some feeling at quite high levels that perhaps we ought to do a bit better than putting our instruments into American rockets. Indeed we can almost imagine the Defence White Paper for around 1965 being rather restrained about the possibilities that experiments might be made with military satellites.

It was splendid to see in a recent article that Marshal of the R.A.F. Sir Dermot Boyle, then Chief of the Air Staff, made no secret of his belief that the time was coming when the Service would be taking over duties in space. Earlier this week that distinguished aeronautical engineer Sir George Edwards, invited to give the Lord Trenchard Memorial Lecture at Halton, fired the imagination of his young Service listeners with an outline of what he expected in the time taken for one of them to reach the position of Chief of the Air Staff, i.e., around 1995.

Nevertheless, while such exciting developments are coming into view, a steady programme of research at Government level into the comparatively mundane things of earthbound aviation is still necessary. This could be good commercial sense for if our friends in the United States are going to be so busy exploring space, somebody will be needed to look after the bread-and-butter business of air transportation.

We suggest that there might be much more official solicitude about the problem of noise. So far every step forward in aeronautical development, if we except the steady improvement of the silent sailplane, has been accompanied by the production of more noise. Surely, it is about time that there was an item in one of the Estimates, or at least serious reference in one of the accompanying memoranda, to the question of how to increase quietness. We are sure there would be tremendous popular support for such expenditure.

Editor - - - - - THURSTAN JAMES
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Matters of Moment

Defence Against the ICBM

FIRST steps in erecting our defences in the U.K. against attack by missile have been taken. Last week, a White Paper: "Ballistic Missile Early Warning Station in the U.K." (Cmnd. 946) was presented to Parliament by the Secretary of State for Air. The station, to be set up at Fylingdales Moor, Yorkshire, is to be commanded by the Royal Air Force. The technical installations are to be operated by the R.A.F. in accord with a joint plan to be agreed by the R.A.F. and the U.S.A.F. The U.S. Government is to provide the long-range radar equipment, the data processing equipment, the electronic, internal communications, and other related specialized equipment, as well as the necessary spares for the first five years of operation. The U.S. Government will also be responsible for the installation of the special radar and associated equipment

The land, buildings and installations other than those set out above will be provided by the U.K. Government. The site is to be about four square miles of national parkland. The British contribution is reported to be about £8 million of the £43 million total.

Fylingdales Moor is the third station of the BMEW chain, the other two stations being at Clear, Alaska, and Thule, Greenland.

The installation at Fylingdales Moor is expected to give about 15 minutes' advance warning of a ballistic missile attack on the United States, and probably more than four minutes in the case of the United Kingdom It should be capable of detecting a ballistic missile or artificial satellite at a range of 3,500 miles.

In view of the high power of the radar transmitter and the resultant "thermal radiation" a safety area immediately in front of the installation will be necessary.

It is now nearly four years since two articles in THE AEROPLANE (October 26 and November 2, 1956) discussed the possibilities of defence against the ICBM. The authors concluded that if detection of the attacking missile could be provided, knowledge of the art was such that defence against ICBM attack upon a specific target area using an anti-missile missile appeared feasible and practical.

A suitable comment upon the situation may be deduced from the recent successful interception (January 29) of an Honest John artillery rocket by a Hawk low-altitude surface-to-air missile at White Sands, in the United States. Furthermore, military thinking is now interesting itself in the jump-down satellite so it is early days to reach the conclusion that the missile "will always get through."

Getting Into Space

IT was rewarding to read in the *Sunday Times* of February 21 an article by Mr. Woodrow Wyatt, M.P., urging the Government to take a stronger line in space-research.

While no one would doubt the wisdom of "getting our feet wet" in space with a co-operative programme with the United States, using the Chance Vought Scout to launch our instruments, it is becoming increasingly accepted that the U.K. must have a space-programme based on its own rockets.

As Mr. Duncan Sandys has stated, a combination of Blue Streak and Black Knight, with a "solid" third stage, could orbit a payload of nearly one ton. This would open up many new opportunities beyond those of upper atmosphere research.

By the end of this year, when Blue Streak is fired at Woomera, we shall have perhaps 85% of the facilities for a major British space-programme, millions for which have already been subscribed from the defence budget. It seems to have been realized at last that Blue Streak must go on.

As two correspondents from the British electronics industry jointly point out in this issue, there is considerable interest in the radio-repeater satellite. Indeed, it is quite possible that if we remain inactive, Russia and America may dominate the field of long-distance communications within 10 to 15 years. It is a pity that Mr. Wyatt did not have an opportunity to enlarge on such important developments nor on the prospects of satellites for precision navigation and long-range, global, weather survey.

These techniques appear to have both commercial and defence significance.

The ability of other nations to launch military satellites—which sooner or later are certain to embrace new methods of global reconnaissance and thermonuclear delivery—must surely lead to the development by ourselves of suitable counter-measures.

PERSONAL INSPECTION.—Sir William Strath, Permanent Secretary of the Ministry of Aviation, extreme right with Sir Matthew Slattery, chairman and managing director and Mr. G. T. Gedge, assistant general manager. He was visiting the Belfast works of Short Brothers and Harland on Feb. 17.

Fairey Board Changes

FOLLOWING recent news of the acquisition of the Fairey Company's subsidiary, Fairey Aviation, by Westland Aircraft, Ltd., has come an announcement of new appointments and changes to the board of the parent company. Mr. G. W. Hall, F.R.Ae.S., M.S.A.E., continues as chairman, but relinquishes his appointment as managing director, to which post Mr. C. H. Chichester Smith, D.S.C., A.F.R.Ae.S., has been appointed. Mr. C. C. Vinson, F.C.A., has been appointed an additional director; and Mr. L. S. Dawkins also becomes a director and retains his appointment as secretary.

Mr. C. H. Chichester Smith has been a member of the Fairey board since 1942, when he was general manager of the Stockport group of factories for Fairey Aviation. In 1943 he moved to Hayes to become general manager and subsequently joint assistant managing director of Fairey Aviation. When the parent company was reorganized in 1959 as a holding company (The Fairey Co., Ltd.) with eight subsidiary companies, he became chairman of the two new subsidiaries, Fairey Aviation, Ltd., and Fairey Engineering, Ltd.

Mr. C. C. Vinson rejoins the company after an absence of eight years. He originally joined Fairey in 1934 as secretary; he became a director in 1937 and joint assistant managing director in 1945. He left in 1952 to become a business consultant.

Mr. L. S. Dawkins joined Fairey Aviation at Hamble in 1936, was appointed chief accountant in 1948, commercial manager in 1952 and secretary in 1956. He was appointed secretary of the holding company when the Group was reorganized.

Looking Ahead

ONE of the newer materials that is already in use in the nuclear-power industry and likely to become one of the more important ones for future missile and satellite applications is beryllium. It has the same density as magnesium and a stiffness 40% greater than steel. Moreover, it has a melting point of no less than 1,278° C.

At Coventry this week, Sir W. G. Armstrong Whitworth Aircraft, Ltd., is opening a large-scale plant for the machining of beryllium. It is, in fact, said to be the first of its kind in the country. Readers will recall that some weeks ago we were able to report progress at Britain's first beryllium production plant—at I.C.I.'s Metals Division in Witton, Birmingham (THE AEROPLANE AND ASTRONAUTICS for December 18, 1959).

Quite clearly, with this "specialized" material firmly established in the nuclear-power field, Armstrong Whitworth is likely to find an increasing demand for the machining of the metal for various purposes. Indeed, in this new venture, the A.W.A. team is looking well ahead to the future and, as developments with beryllium proceed, it will be well placed as one of the British pioneers in this particular field.

The new factory building at Coventry embodies all the

elaborate precautions necessary to avoid the hazards associated with beryllium dust—which can cause serious lung troubles. The plant contains, for example, "pressure cells" supplied with filtered and heated air which is changed every three minutes.

All machining processes are accomplished with equipment that is completely enclosed and provided with high-speed extraction systems. Also any air that leaves the "contact areas" in the building is taken through a filter system and is purified before being discharged to atmosphere through a 120-ft.-high chimney.

Towards the Supersonic Transport

IN answer to a question in the House of Commons on February 22, Mr. Duncan Sandys, the Minister of Aviation, disclosed that active steps were being taken towards solving the problem of developing a supersonic civil transport. He was, he said, placing separate study contracts with each of the major airframe groups and the aero-engine groups, "all of whom have for some time been studying this problem."

These companies, explained Mr. Sandys, had been asked to consider the technical issues involved—including the question of optimum speed—as well as the economic prospects. They had, he said, been asked to explore the possibility of collaboration with suitable foreign firms. And he made it clear that, when the studies were completed, there would be no question of placing more than one contract for a supersonic civil aircraft.

Second Decca-defined Airway

THE problem of accurate navigation and position-reporting along a busy over-ocean airway is one that can be satisfactorily solved at present only by the use of an area-coverage radio-aid system. Typical of such a problem is that involving Airway Blue 26 (lying between Amber 1, abeam Hastings, and the Channel Islands) which is to be re-introduced this year after a short initial period of use late last summer.

Previously Red 1, between Dunsfold, Hurn and the Channel Islands Control Zone was the only section of controlled airspace for U.K.-C.I. traffic and this had become very congested. Use of the alternative airway, from its dog-leg junction with Amber 1, involved homing, respectively, on Jersey's NDB or Lydd's VOR and it became clear last year that navigational accuracy was inadequate—and especially so for the holding of aircraft near the Amber 1 intersection and outside the C.I. Control Zone.

Blue 26 will be re-introduced as a Decca-defined airway above 7,000 ft. with Decca reporting and holding points. This will be the second U.K. airway to be so designated; Amber 1 Decca is already in use as a climb-out airway for aircraft northbound from London. It is expected that appropriate A.T.C. and navigational procedures will be developed in the near future for use in the C.I. Control Zone.

Wakefield Castrol's New Home

ONE of the more impressive of last week's events was the formal opening of the new headquarters of the Wakefield Castrol Group. This is Castrol House, in the Marylebone Road, London—a fine example of the modern architectural style, 13 storeys high. The ceremony was performed, on February 22, by the Minister of Transport, the Rt. Hon. Ernest Marples, who, naturally enough, laid emphasis on the motoring aspects of the Group's activity. However, as Mr. L. W. Farrow, C.B.E., chairman of C. C. Wakefield and Co., Ltd., said in his speech of introduction, the name Wakefield has also played a sizeable part in British aviation.

Indeed, Lord Wakefield, the founder of the company, was known as the Patron Saint of Aviation and many were the aeronautical record-breakers of the between-Wars period who owed their successes to his active help and encouragement. The company had been in existence 10 years when Castrol was introduced—in 1909—as a lubricating oil. And right from the start it played a leading part in aero-engines.

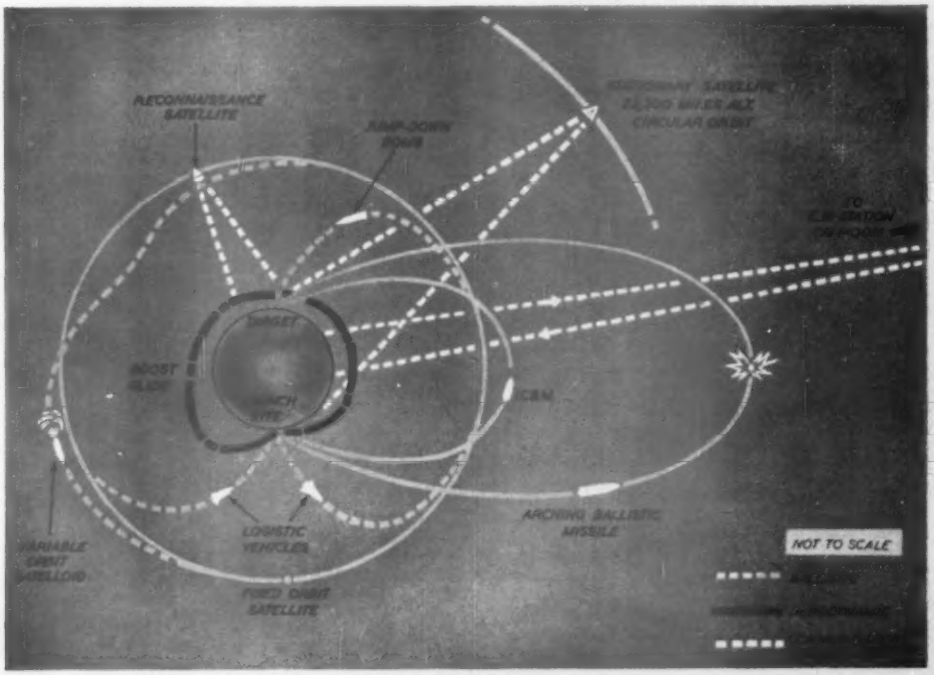
The name Castrol quickly became closely associated with most of the record flights of the early formative years of aviation. Its most recent aeronautical association came at the beginning of this year when it was announced that Castrol 98—a new lubricant developed specially for gas-turbine engines—had been officially approved and adopted by British European Airways for use in the Corporation's Viscounts and Comets.

Christopher McCarthy-Jones

NEWS from Nigeria of the death from polio of Chris McCarthy-Jones has shocked his many ex-R.Aux.A.F. friends and other aviation associates. Barely 40, he was an energetic, enthusiastic capable man to whom, one felt, this sort of thing could not happen. He loved flying.

He got his wings with the R.A.F.V.R. at Nottingham in 1937 and at the beginning of the War was flying with a Lysander squadron. He soon transferred to fighters which he flew until 1943 when he was shot down over Lille and made a prisoner. After the War he joined the R.Aux.A.F. and in 1950 commanded No. 504 County of Nottingham Sqn. Then he moved to No. 601 County of London Sqn., first as a Flt. Cdr., then as C.O. from 1951 until 1956. He kept closely in touch, partly by serving at North Weald, 601's home station, as Wg. Cdr. Ops., R.Aux.A.F. He was a splendid leader, a man of understanding and kindness.

His commercial interests included a period with Air Trainers, Ltd. For the past two years, in association with Desmond Norman (son of Sir Nigel Norman, both, in their times, members of 601), Chris had worked in Lagos, demonstrating, selling and ferrying aeroplanes.—WREN.



PATHS IN SPACE.—This comprehensive diagram showing various space-missions of civil and military interest has been produced by the Hawker Siddeley Group team.

The Industry Regrouped

FEW industries can have changed their structure so rapidly and drastically as Britain's aircraft industry has done in the past four months. When Mr. Duncan Sandys became Minister of Aviation last October he suggested that the industry should form itself into five major groups—two producing fixed-wing aircraft and missiles, two responsible for aero-engines and one producing helicopters. The object of such grouping was to strengthen the technical and financial resources of manufacturers, so that the industry could meet foreign competition more effectively and produce modern aircraft more rapidly than had hitherto been possible. Though these groups will be the main recipients of Government support they will not necessarily be the sole recipients. Mr. Sandys has made this clear.

The groups suggested by Mr. Sandys are now a *fait accompli* although their composition may not be exactly as he had in mind. Aircraft and missiles will be the concern of Hawker Siddeley, which has taken over the Blackburn and de Havilland groups, and also of a new company to be owned jointly by the English Electric Co., Ltd., Vickers, Ltd., and the Bristol Aeroplane Co., Ltd. This new company will incorporate English Electric Aviation, Ltd., Vickers-Armstrongs (Aircraft), Ltd., and Bristol Aircraft, Ltd. Negotiations are, it has been said, at present in hand for Hunting Aircraft, Ltd., to join this group.

Two engine groups had already been formed. So far they have remained unaltered while the rest of the industry has been regrouping. They are Rolls-Royce, Ltd., and Bristol Siddeley Engines, Ltd. At present the de Havilland Engine Co., Ltd., and Blackburn Engines, Ltd., both now owned by Hawker Siddeley, Alvis, Ltd., and D. Napier and Son, Ltd., an English Electric subsidiary, remain outside the two major engine groups.

Westland Aircraft, Ltd., which had already taken over Saunders-Roe, Ltd., has acquired Fairey Aviation, Ltd., and the helicopter interests of Bristol Aircraft, Ltd., to form the helicopter group.

It will surely seem singular to the reflective observer that although the Space Age dawned some time ago, on Oct. 4, 1957, to be precise, when the Soviet Union launched the first man-made satellite to go into orbit, there has been no mention whatever by the Government of any specialization in the field of space-vehicle development, yet it is quite obvious that during the next decade such activity must increasingly be a charge on the public purse.

A clear distinction can be established between the merger arrangements which have led to the English Electric/Vickers/Bristol group and the way in which the new Hawker Siddeley and Westland groups have been formed.

In the first case the English Electric Company, Ltd., Vickers, Ltd., and the Bristol Aeroplane Co. have merged their aircraft interests—only those in Britain in the case of Bristol—in a new holding company which it has been suggested may be called the British Aircraft Corporation, thus preserving the initials which have been internationally famous for so long. The English Electric, Co., Ltd., owns a 40% interest in this company, as does Vickers, Ltd.; the Bristol interest is 20%. It is worth emphasizing that the English Electric Co., Ltd., and Vickers, Ltd., are large industrial companies and it is their aviation subsidiaries which have merged. In this way all three companies retain an interest in their aircraft activities. Financial arrangements for types in current production are not affected by the grouping.

A different procedure has been followed by Hawker Siddeley and Westland, who have made take-over bids for the new companies in their groups or bought them outright. Thus, de Havilland Holdings and the Blackburn Group have been taken over in their entirety by the Hawker Siddeley Group and are now wholly owned subsidiaries. Arrangements have been made for certain directors of the taken-over companies to serve on the board of the parent Hawker Siddeley Group.

Westland Aircraft, Ltd., has bought outright Fairey Aviation, Ltd., and the helicopter interests of Bristol Aircraft, Ltd., and has taken over Saunders-Roe, Ltd. There is now no helicopter activity outside the Westland group.

It is interesting to note that the companies which have emerged in control are those which had substantial non-aeronautical interests before the reorganization of the industry. As with English Electric and Vickers, Hawker Siddeley had the greater part of its interests in non-aeronautical work before the take-overs. Westland Aircraft, Ltd., was controlled by John Brown and Co., Ltd., before the recent take-overs and this company retains the major interest in Westland.

The aero-engine groups, Rolls-Royce, Ltd., and Bristol Siddeley Engines, Ltd., already have wide industrial interests and are by no means dependent on their aircraft engines alone. Bristol Siddeley, however, is in an interesting position as it is owned 50% by the Hawker Siddeley Group and 50% by the Bristol Aeroplane Co., Ltd. Rolls-Royce is independent of any airframe companies.

Loose Ends

A confusing feature of the industry's reconstruction is the way in which some companies have been divided. The position is clear-cut where groups such as de Havilland and Blackburn have been taken over, lock, stock and barrel, complete with all their industrial and overseas subsidiaries. Even here, though, things are slightly complicated. For example, when Westland took over Saunders-Roe, two industrial subsidiaries of Saunders-Roe went to de Havilland, and thus, in turn, have now gone to Hawker Siddeley.

In other cases the position is less simple. Take the Bristol Aeroplane Co., Ltd. It now holds a 10% interest in Westland Aircraft, Ltd. (as part payment for Bristol helicopter interests),

English Electric/Vickers/Bristol Group	Hawker Siddeley Aviation, Ltd.	Westland Aircraft, Ltd.	Other Companies	Bristol Siddeley Engines, Ltd.	Rolls-Royce, Ltd.
AIRCRAFT	AIRCRAFT	AIRCRAFT	AIRCRAFT	ENGINES	ENGINES
Lightning Canberra **T.S.R.2** Scimitar Britannia Vanguard **VC10** **VC11** Viscount **Bristol 188** **Bristol 216 car ferry**	Javelin Hunter Sea Vixen Gnat Vulcan 2 N.A. 39 **P.1127** **Avro 748** Hunter and Gnat trainer **A.W. 660** Argosy Comet 4 **D.H. 123** Heron Dove **Airco/D.H.121**	Gannet AEW.3 F.D.2 research	H.P. Victor 2 and Dart Herald Hunting Pembroke/President **Hunting jet-flap research** **H.P. 115 research** **Hunting 107** Short S.C.1 Hunting Jet Provost Auster light aircraft Short Britannic Scot. Av. Twin Pioneer **Av. Traders DC-4 freighter** Miles Student **Short S.C.7**	BE.53 Olympus Sapphire Orpheus Viper Proteus Gamma Thor BE.58 BE.61	Avon Conway RB.108 RB.145 Dart Tyne Blue Streak motor RB.141 RB.163
MISSILES	MISSILES	HELICOPTERS	MISSILES		
Thunderbird and developments Bloodhound and developments Blue Water Vigilant	Blue Streak Seaslug Firestreak and developments Blue Steel	Whirlwind Wessex Westminster Widgeon **Wiltshire** Wasp Skeeter Bristol 192 Rotodyne	Short Seacat Fairey anti-tank		
ENGINES	ENGINES	MISSILES	ENGINES		
None	Bombardier Gipsy Major Gyron Junior Turmo Gnome Nimbus (A.129) Spectre and Double Spectre	Black Knight research vehicle	Napier Eland and Gazelle Alvis Leonides and Leonides Major		
		ENGINES			
		None			

PRODUCTS AND PROJECTS—Aircraft, missiles and engines in production or under development by the British aircraft industry (S.B.A.C. members) are tabulated above. The aircraft shown in bold type are either in their early development stages or are leading "paper projects"; none of them has yet flown.

a 20% interest in the new English Electric/Vickers/Bristol group, a 50% interest in Bristol Siddeley Engines, Ltd., a 15¼% interest in Short Brothers and Harland, Ltd., and a 50% interest in Bristol Aerojet, Ltd. In addition, it retains control of the industrial activities of Bristol Aircraft, Ltd., and all the Bristol overseas subsidiaries.

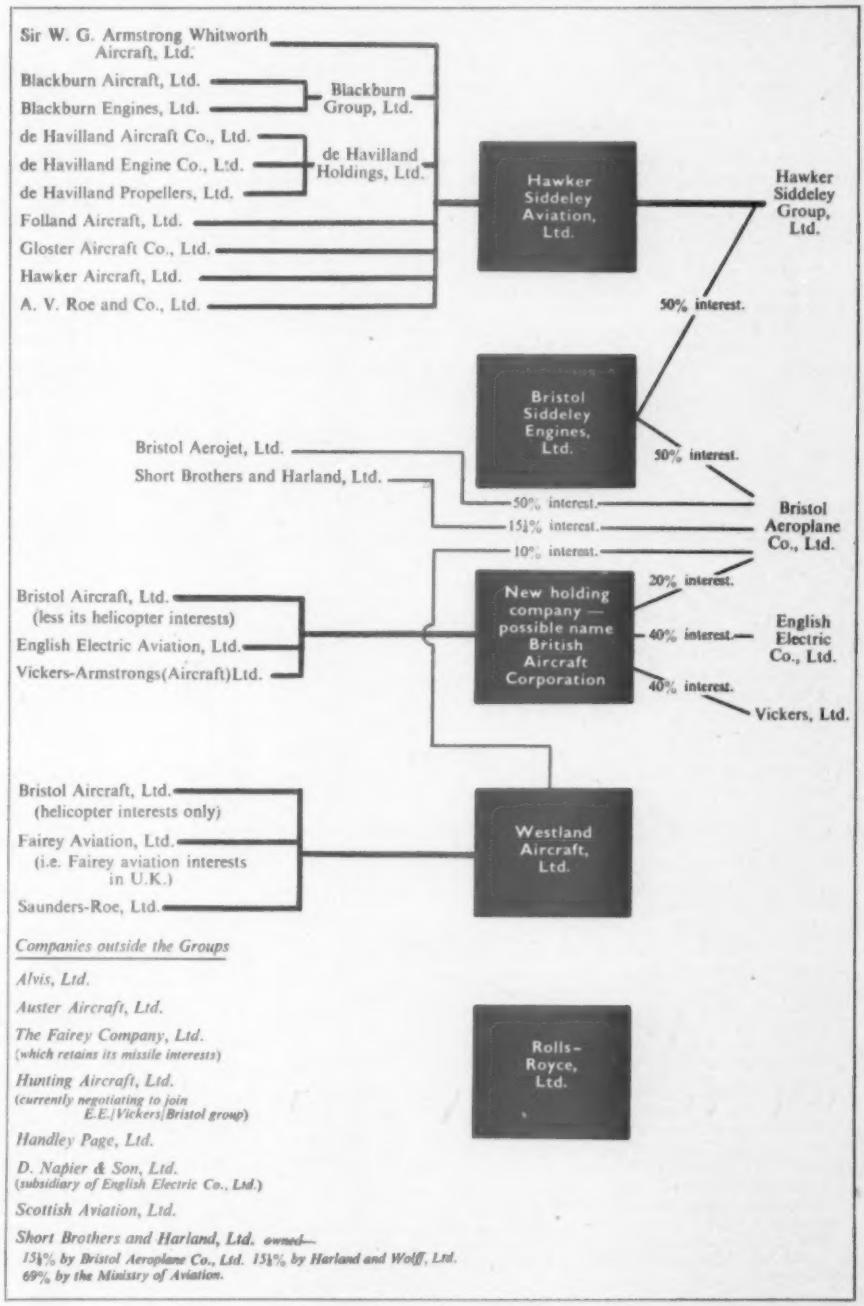
The Fairey Company, Ltd., retains its industrial interests and all its subsidiaries except Fairey Aviation, Ltd., which has been bought by Westland Aircraft, Ltd. It has thus effectively ceased to be an aircraft manufacturer in Britain, although it retains its interests in missiles, at present anti-tank, aircraft power controls and pilotless target aircraft. Its Belgian subsidiary is to continue to build aircraft of other than Fairey design. The Fairey companies in Canada and Australia remain under Fairey control.

Nevertheless, the virtual disappearance of the name Fairey from British aviation brings up the continuance of other famous names, such as Blackburn and de Havilland and Bristol. It is difficult to believe that they will prove to have been grouped out of existence.

An outstanding anomaly appears to be the Airco group, in which de Havilland, Hunting and Faireys associated themselves for the development of the Airco/D.H. 121 jet transport. Negotiations are at present in hand for Hunting Aircraft, Ltd., to join the English Electric/Vickers/Bristol group; if this happens there will be Airco partners in all three major airframe groups. A final solution could well be for the Hawker Siddeley Group to take over full responsibility for this aircraft.

Two engine companies, Alvis, Ltd., and D. Napier and Son, Ltd., remain outside the new groups. Napiers, owned by the English Electric Co., Ltd., may well be asked to collaborate with Rolls-Royce over the auxiliary compressors and clutches for the Tyne installation in the new Rotodyne. Napiers have gained much useful experience with these units in the Eland-powered prototype. There is speculation that such collaboration might lead to further links over the Eland and Gazelle.

Following the recent takeovers, two engine companies are now controlled by Hawker Siddeley; these are Blackburn Engines, Ltd., and the de Havilland Engine Co., Ltd. As Hawker Siddeley is predominantly concerned with aircraft and missiles, it would be logical for these companies to join one of the two main engine groups. Bristol Siddeley Engines, Ltd., appears an obvious choice because it is 50% owned by Hawker Siddeley. If this move were made, Bristol Siddeley would monopolize the construction of small piston engines in this country. The only other piston-engine manufacturer is Alvis.


Sir W. G. Armstrong Whitworth Aircraft, Ltd.
Blackburn Aircraft, Ltd.
Blackburn Engines, Ltd.
Blackburn Group, Ltd.
de Havilland Aircraft Co., Ltd.
de Havilland Engine Co., Ltd.
de Havilland Propellers, Ltd.
de Havilland Holdings, Ltd.
Folland Aircraft, Ltd.
Gloster Aircraft Co., Ltd.
Hawker Aircraft, Ltd.
A. V. Roe and Co., Ltd.
Hawker Siddeley Aviation, Ltd.
Hawker Siddeley Group, Ltd.
50% interest.
Bristol Siddeley Engines, Ltd.
50% interest.
Bristol Aerojet, Ltd.
Short Brothers and Harland, Ltd.
50% interest.
15¼% interest.
Bristol Aeroplane Co., Ltd.
10% interest.
20% interest.
Bristol Aircraft, Ltd. (less its helicopter interests)
English Electric Aviation, Ltd.
Vickers-Armstrongs(Aircraft)Ltd.
New holding company — possible name British Aircraft Corporation
40% interest.
English Electric Co., Ltd.
40% interest.
Vickers, Ltd.
Bristol Aircraft, Ltd. (helicopter interests only)
Fairey Aviation, Ltd. (i.e. Fairey aviation interests in U.K.)
Saunders-Roe, Ltd.
Westland Aircraft, Ltd.
Companies outside the Groups
Alvis, Ltd.
Auster Aircraft, Ltd.
The Fairey Company, Ltd. (which retains its missile interests)
Hunting Aircraft, Ltd. (currently negotiating to join E.E./Vickers/Bristol group)
Handley Page, Ltd.
D. Napier & Son, Ltd. (subsidiary of English Electric Co., Ltd.)
Scottish Aviation, Ltd.
Short Brothers and Harland, Ltd. owned—
15¼% by Bristol Aeroplane Co., Ltd. 15¼% by Harland and Wolff, Ltd.
69% by the Ministry of Aviation.
Rolls-Royce, Ltd.

THE REORGANIZED INDUSTRY.—Affiliations of major companies and the composition of the five main groups are given above. Internal organization of the groups has not yet been announced, but is likely to be as shown.

The Outsiders

The two main aircraft companies outside the new groups are Handley Page, Ltd., and Short Brothers and Harland, Ltd. The only other ordinary members of the S.B.A.C.—leading British airframe and engine constructors—not involved in the new groups are Auster Aircraft, Ltd., Boulton Paul Aircraft, Ltd., Scottish Aviation, Ltd., and, as mentioned, Alvis and Napier.

It may well be that the independent position of Handley Page, Ltd., will not adversely affect its future. Handley Page is a company whose achievements and influence are out of all proportion to its physical size; its current activities and diversification interests should keep it busy for several years to come. In addition, Mr. Sandys has said: "We do not exclude the possibility of placing orders outside the groups for specialist requirements. For example, there may be a firm building a small aircraft which is not within the programme of the major groups, or it might be social or public policy to place a particular order." Thus, Handley Page could receive an order for a laminar-flow research aircraft, as the company has specialized in this technique. In fact, it already holds an order for another research aircraft, the H.P. 115, which will be used to study the low-speed behaviour of a supersonic-transport configuration.

Short Brothers and Harland, Ltd. are in a special position. Although a small proportion of their capital (15¼%) is owned

by the Bristol Aeroplane Co., Ltd., the major holding (69%) is in the hands of the Government. Moreover, as it is a major employer of labour in Belfast, its continuance is a matter very close to the heart of the Government of Northern Ireland. It has yet to be made clear whether the important development programme it has in hand for the Britannic military transport will bring this company into the field of influence of the new Vickers/English Electric/Bristol consortium. Possibly, but Mr. Sandys has stated that he had not sought to encourage an amalgamation affecting this company.

Financial control of the three airframe groups has been decided; almost every other problem lies ahead. Ways of rationalizing facilities, company organization and design teams must be decided. It must inevitably be many months before all the decisions are made. Many well known and individualistic personalities must be fitted into new group organizations.

Other decisions must be taken. The table on page 244 shows how certain projects are competitive between groups; others are competitive within the groups. The future of these competitive products must be decided.

The major inter-group one at present is the clash between the Airco/D.H.121, which is on order for B.E.A., and the projected Vickers VC11 which may well be ordered for Trans-Canada Air Lines. According to Mr. Sandys, providing commercial prospects justified it, "I should not like to rule out the possibility of the Government supporting two overlapping prospects."

Typical products which compete within a group are the Bristol Bloodhound and English Electric Thunderbird missiles. The Bloodhound has enjoyed the greater commercial success; should both missiles still be developed? The customers will probably decide on this.

Following the regrouping of the industry, Mr. Sandys has promised increased Government support for promising civil aircraft projects and aero-engines. The forms which this help might take are discussed below in relation to the various present and future civil aircraft for which, no doubt, the industry will be quick to claim some help.

Mr. Sandys has made it clear that the Government intends only to share and not to remove the risks of developing new airliners; if a project fails, the company concerned will lose money since the Government is limiting its aid to half the cost involved.

This policy must greatly help civil aircraft manufacture; it now remains to be seen which projects will receive support.

On the military side, Mr. Sandys is confident that the industry will now be better fitted to meet the needs of modern defence. Here the new groups should ensure that the fewer military types needed are developed more rapidly than in the past. But, as with civil transports, the potential benefits offered by the strength of the new groups will depend almost entirely on their own internal reorganization. The financial arrangements have now been completed, but most of the decisions which will decide the future success or failure of the groups have yet to be made.

Candidates for Government Support

NOW that the Government's policy in respect of civil aircraft development in this country has been clearly stated—by Mr. Duncan Sandys on Feb. 15 (see our previous issue, page 212)—it is possible to consider which types of aircraft might be expected to benefit. The nature and extent of the assistance to be given by the Government, as the Minister pointed out, will vary, but will fall broadly into three categories, as follows:—

1. A contribution towards the development, tooling or other initial costs of launching a new type.
2. A share in the risks involved in producing a limited number of aircraft beyond those for which firm orders have been received.
3. A contribution towards the cost of proving a new type, and introducing it into regular airline service.

There is, presumably, no reason why one type should not benefit from any or all of these forms of support. The following list shows the major civil transport projects on which the British industry is at present actively engaged, and suggests the kind of backing which might be claimed for them. In several cases, help is needed urgently if it is to be effective; the industry is entitled to expect quick implementation of the new Government policy.

AIRCO/D.H.121.—Twenty-four are being built for B.E.A. but all development costs are at present being borne by the Airco consortium. This project could qualify for help in all three categories; Government finance for a further production batch would be most valuable. A D.H.121 Mk. 2, with longer range and greater capacity, was mentioned last week by Sir Roy Dobson as being in competition with the Vickers VC11, and as a paper project would bid for a Government contribution towards development costs.

ARMSTRONG WHITWORTH ARGOSY.—Ten are being built as a Hawker Siddeley private venture. No firm sales made to date. The R.A.F. order for 20 of the military version has helped to spread development costs. A contribution to proving costs is indicated.

AVIATION TRADERS A.T.L.98.—In a class all its own, the A.T.L.98 car ferry and freight conversion of the DC-4 appears to qualify for some measure of support in view of the considerable amount of interest being shown by foreign operators. The Airwork group has financed all development to date.

AVRO 748.—Another of the Hawker Siddeley private ventures, for which a few airline orders have already been obtained. Nearly £3 million has been committed to date. Contributions towards development and proving costs seem to be justified.

BRISTOL 216.—A Dart-engined car ferry project, designed to Silver City requirements. Could qualify for help in all categories if market research indicates a reasonable demand among other operators.

D.H. COMET.—In full production with 42 ordered. Other sales prospects appear good and should justify additional aircraft being laid down immediately with Government support.

D.H.123.—A Gnome-engined feeder-liner for about 30 passengers. Like the Bristol 216, a project qualifying for Government support if its construction can be justified at all.

HANDLEY PAGE DART HERALD.—Indirect Government support has already been given with the order for three to be used by B.E.A. and further help might be claimed. The makers have spent over £3 million on development.

HUNTING H.107.—This short-haul jet for about 50 passengers requires across-the-board Government support if it is to proceed. Such support is presumed to be conditional upon Hunting Aircraft joining the Vickers/English Electric/Bristol group, as is now being discussed. Development of the Bristol Siddeley turbofan for this project would also require to be subsidized.

SHORT BRITANNIC.—The R.A.F. order for about 10 will cover initial development costs. If market surveys indicate airline interest in a commercial freighter version, Government support for production of a small batch seems to be indicated.

VICKERS VANGUARD.—In production with 40 ordered and other good sales prospects. Government support for an additional quantity seems to be the best assistance for this type. All development to date at Vickers' expense.

VICKERS VC10.—Backed by B.O.A.C., which has ordered 35 and will soon order 10 more. As Britain's largest transport project, the VC10 would seem specially to qualify for a Government contribution to development and proving costs. All development to date at Vickers' expense.

VICKERS VC11.—A smaller variant of the VC10 design for ranges up to 3,000 miles. Government support of this project must be conditional upon airline support; a firm order of reasonable size could be expected to bring a contribution to development and proving costs.

WESTLAND FAIREY ROTODYNE.—A £4 million development contract has already been placed, and a military order may be negotiated soon. It has already been made clear that B.E.A. will require Government support for proving the type in operational service.

SUPERSONIC TRANSPORT.—Study contracts have now been placed with the major airframe and aero-engine groups for investigation of the technical issues involved in designing a supersonic airliner and for assessment of its economic prospects. Without such studies, any decision about the nature of Government support, and the nature of the transport itself, can be little more than shots in the dark. When—and if—the time comes for contribution to proceed, massive Government financing will be necessary, on a scale quite different from the other projects listed above.

So much for the contenders. Mr. Sandys' statement gave no indication of the basis upon which projects would be selected for Government support, nor of the extent to which his Ministry would seek to impose a logical pattern upon civil aircraft development in Britain by this means. But in reaching his conclusions concerning which aircraft are worth helping, the Minister will presumably be guided by the Transport Aircraft Requirements Committee.

Air Transport

New Deal—or Same Old Formula?

When the new Bill becomes law the Corporations' scheduled-service monopoly will be ended. Whether or not this change is to be a mere technicality will depend on the Licensing Board and on the strength of the independent operators.

AT FIRST glance at the new Civil Aviation (Licensing) Bill—the main points in which were outlined on p. 212 of last week's issue—will leave the impression that it is little more than a means of tidying-up the loose ends of a 15-year-old law which has long been overtaken by events. Conditions have changed a great deal since the original Civil Aviation Act and the Air Corporations Act came into force and the industry could not continue to operate for much longer under the old rulings.

Later reflection leads to two convictions: that practical and political difficulties might have made any more radical changes unworkable; and that the success of the Act, when it is passed, will depend entirely on the strength, experience and qualities of the new Air Transport Licensing Board.

Even under the continued Ministry authority the Board will still have sufficient freedom to get many things done and to guide a rationalization of the industry to a long-term plan if and when the independent operators combine in groups which are sufficiently strong to be able to operate airlines to standards comparable with those which have been set by the two Corporations.

Many of us would have preferred to have seen an independent and powerful Board which had essential control over the entire British air transport situation, with appropriate powers and experience to make decisions (subject to Ministerial approval) about international agreements. Such powers would not easily be developed and the Ministry can hardly be blamed for maintaining overriding control when it is, in effect, responsible for returns from investments which will amount to some £275 million in the nationalized Corporations.

Meanwhile, neither the Corporations nor the independent operators are likely to be very pleased with the contents of the Bill. The former will complain because a for-all-time, unlimited-frequency monopoly of scheduled services is no longer theirs, and the latter because they will be able to recognize little practical change other than a tightening of the licensing arrangements. It will be for the Board to maintain and develop a just balance of interests and to try to see that some fresh air blows through the air transport business.

The Bill Explained

The independent Air Transport Licensing Board will be set up in place of the present Air Transport Advisory Council. Members—of which there will be no fewer than six or more than 10, including the chairman and deputy chairman—will be appointed by the Minister. There are no specific restrictions on membership, but those who have any interest, as a shareholder or otherwise, in the business of aircraft or licensed aerodrome operation must declare this interest to the Board and the Minister. Fees will be charged for the licences which are granted, and for modifications to these licences, and it is expected that in this way the Board will, in effect, be self-supporting, though its overall expenses and the member's salaries will be paid by the Exchequer.

The work of the A.T.A.C. will continue and is likely to overlap that of the Board since application hearings will necessarily need to be continuous. It might be noted that the Council was originally set up as a "consumer's consultative committee" to which passenger and other complaints and suggestions could be made, but took over the duties of advising the Minister on scheduled service authorizations and thus became, in effect, a licensing authority.

Every operator of aircraft for hire or business will be required to hold an Air Operator's Certificate, which will be issued by the Director of Aviation Safety of the Ministry. This certificate will confirm that equipment, organization and operational arrangements are such as to appear to be adequate for the safe conduct of the business.

This is no more than an extension of existing arrangements. New applicants for scheduled-service approval are at present "vetted" by the Director of Aviation Safety. This procedure is now to be applied to civil air operators of all kinds—with special emphasis on companies operating non-scheduled or charter services which, though not at present subject to this control, may, in fact, be carrying large numbers of passengers.

All operators of scheduled services *and* of certain passenger charter services will be required to hold an Air Service Licence, which will be issued by the Board. Only whole-capacity charters and the following services are exempted from this requirement: Passenger flights beginning and ending at the same place (i.e. local pleasure flights); ambulance and rescue services; flights involving the carriage of not more than seven persons, including the crew, in aircraft not equipped to carry more than this number of persons (i.e. "taxi" flights); flights carrying members of an operator's or owner's staff and equipment; training flights; test and demonstration flights; agricultural operations; and air photography flights.

The important exemption applies to flights in which the whole capacity of the aircraft has been chartered for the carriage of cargo or passengers—and is not "sub-let" to other shippers or to passengers who are paying separate fares. This proviso ensures that a licence must be obtained for charter flights on which passengers are, in effect, booked separately through an agency, club, or other means and by which the present law can be circumvented.

In deciding whether an Air Service Licence shall be granted, and in what conditions, the Bill explains that the Board will consider:—

(a) Whether they are satisfied that, having regard in particular to his experience and financial resources and . . . to his ability to provide satisfactory equipment, organization and staffing arrangements, the applicant is competent, and a fit and proper person, to operate aircraft for the purposes for which he seeks an Air Service Licence.
(b) The need for any air transport service proposed.
(c) In the case of any air transport service proposed, the adequacy of any similar service authorized by any Air Service Licence already granted and the tariff, if any, in respect of that similar service.
(d) The extent to which any air transport service proposed would be likely to result in wasteful duplication of such services or in material diversion of traffic from any such service authorized by any Air Service Licence already granted.
(e) Any capital expenditure reasonably incurred, or any financial commitment or commercial agreement reasonably entered into, in connection with the operation of aircraft on air transport services by any person (including the applicant) who is the holder of any Air Service Licence already granted.
(f) Any objections or representations made in accordance with any relevant regulations under . . . this Act.
(g) Any observations made to the Board by the Minister.

All this might appear to give the Board fairly adequate powers apart from those which might be restricted by the "observations made . . . by the Minister." But those powers are, in fact, greatly restricted by the fact that negotiations over foreign route rights, and decisions about overseas fares, remain in the hands of the M.o.A. and the Minister is empowered to direct the Board to refuse the grant of a licence involving international negotiations for traffic rights which he considers "inexpedient for the time being to seek."

Fares and freight rates will be fixed by the Board only for domestic services, including those to and from the Channel Islands; all others will be fixed by the Ministry.

Obviously, when the Act comes into force, all operators will require licences so that their present services can be continued, and transitional arrangements will be necessary. Licences will be automatically issued to operators of services already authorized; these licences will be for terms, and subject to conditions, which may be specified following further consultations between the Minister and the operators, both Corporations and independents.

Since it is intended that all air transport operators shall have equal right to apply for licences, section 24 (except sub-section 2) and section 25 of the Air Corporations Act, 1949, will be repealed. These are the sections which grant a monopoly of scheduled services to the two Corporations and their associates. Sub-section 2 carries the sentence which gives the legal definition of a "scheduled journey."

The hearings of the Board will probably be in public except when this is inexpedient for diplomatic or other reasons.

Air Transport . . . .

IFALPA and Radiation

IN continuation of its practical interest in the measurement of radiation hazards for aircraft passengers and crew, IFALPA arranged for readings to be taken on flights between Tripoli and Kano after the French nuclear test in the Sahara. The flights were made 5 hr. and 21 hr. respectively, after the expected peak in the area, but the 27 readings, tabulated and published by the Federation, show rises of up to 50 times in the normal radiation level.

IFALPA points out that, though the levels recorded were less than those quoted for a normal X-ray dose, this comparison may be misleading and much more information is required. Similar monitoring will be repeated in the neighbourhood of any future tests, the results will again be offered for publication and the problem is to be regularly reviewed. The Federation has taken some care to prepare for these investigations, and new and tested equipment has been purchased for the purpose.

Good for the A.R.B.

THE situation over the airworthiness delay for B.O.A.C.'s 707-436s was made clearer last week-end with an announcement from Boeing about certain "design improvements." These changes, outlined in our issue of February 5 (p. 150) and including a 35-in. fin extension, a fully boosted rudder and a small ventral fin, or bumper, are to be incorporated in all 707s and 720s in production and kits of parts are to be supplied free of charge to all present operators so that the 707s now in service can be modified when flight and maintenance schedules permit.

As explained in the issue of February 5, a 707-120 with some or all of these modifications has been flying on test since last autumn, and the Air Registration Board has held up the certification of B.O.A.C.'s 707-436s so that these and other changes can be made. Although the U.S. Federal Aviation Agency has certificated the 707s in their unmodified form, the A.R.B. was not prepared to do so.

The fact that the manufacturers are now incorporating the changes and encouraging all operators to do so shows that the modifications represent rather more than the "further refinements in the handling characteristics" mentioned in the Boeing statement—and certainly in so far as they are being applied to the heavier and more powerful variants in the series.

The A.R.B. is to be congratulated on its more flexible approach to airworthiness problems and its firm stand—which must have had an influence on the programme of design changes and on the manufacturer's decision to incorporate them in aircraft which are now in service as well as in those which have still to come off the production lines.

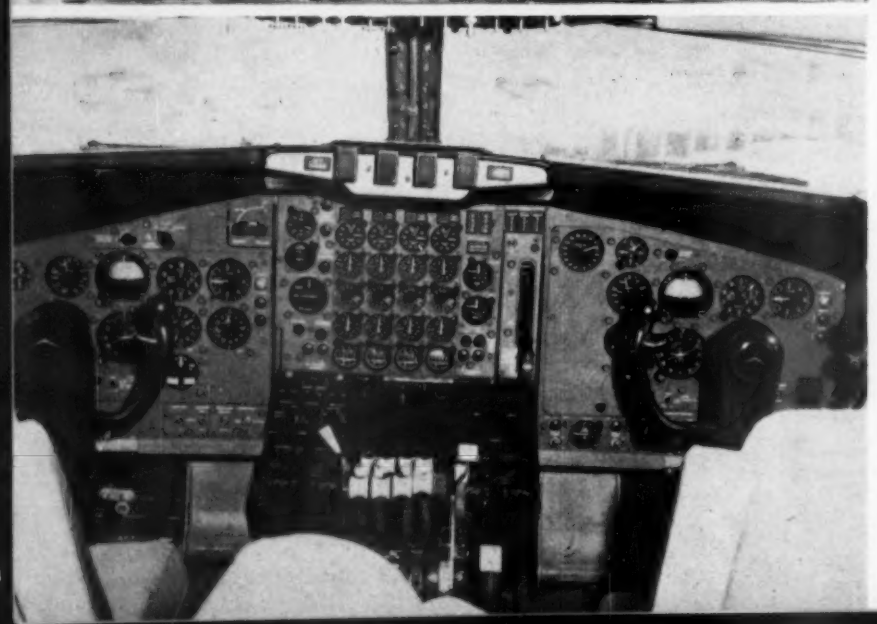
Boeing, too, must be praised for grasping the nettle in this way. Worried though they may have been about the possibility of a catastrophic accident in some extreme situation—such as the failure of two engines on one side at a critical moment during take-off—Boeing, with the aeroplane fully certificated, could justifiably have "left well alone."

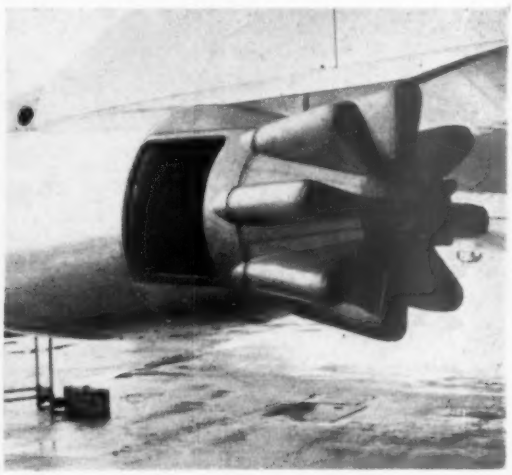
The Hidden Subsidy

THE question of finding means of making airline and other operators pay for this country's en route facilities—A.T.C., navigation aids and communications—is not one to which an answer is likely to be indefinitely delayed. In the Comptroller and Auditor-General's report on the 1958-59 departmental trading accounts and balance sheets (published on February 18) it is stated that the Treasury has taken a serious view of the "deficit" in operating these services and has described the financial arrangements as "a system which involved a subsidy of £2.7 million a year to airline operators."

This figure represents the cost of these services for 1958-59 and is in addition to the deficiency of £6.3 million on the 26 aerodromes operated by the Ministry of Transport and Civil Aviation (now the Ministry of Aviation) during 1958-59. The

(*Continued on page 249*)





FIRST FOUR-TWENTY.—Air India International took delivery of two Boeing 707-420s on February 18—the first of the Conway-engined Boeing transports handed over. On February 20, one of the two aircraft flew from London to Bombay non-stop in 8 hr. 15 min. These pictures show the general styling, the cockpit, and the reversers and noise suppressors on the Conway.

Photographs copyright "The Aeroplane and Astronautics"

Only the VANGUARD

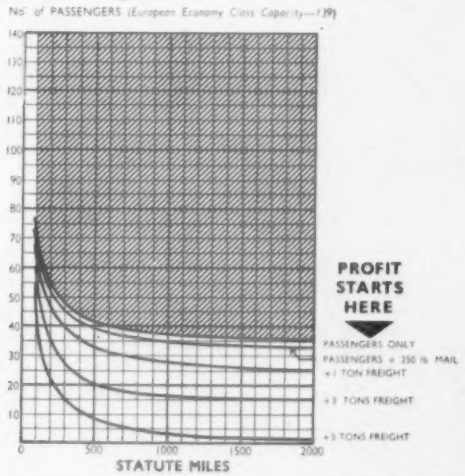
has this low-cost story

THE CONCLUSIONS to be drawn from this simple graph are among the most significant ever put to airline operators. It shows at a glance that the Vickers Vanguard will break even on total costs (indirect costs are taken as 100 per cent of direct) with passenger loads no higher than those actually carried by Viscounts today.

With three tons of freight the passenger break even requirement can be as low as 21 people falling to only 8 passengers when five tons of freight is carried for 500 miles. The Vanguard is a profitable aircraft on today's payloads yet it has room for the inevitable expansion of traffic which, even at a modest progress, makes the Vanguard the biggest potential money earner ever built.

In addition to its outstanding economy, the Vanguard is fully competitive in speed (425 m.p.h. cruise), and its turbo-prop flexibility will enable it to maintain schedules as good as any, while allowing for realistic traffic conditions.

BREAK EVEN NEED—CURRENT TOURIST RATE



BREAK EVEN NEED—PASSENGERS ONLY

500 MILE SECTOR

1ST CLASS	31 PASSENGERS
TOURIST CLASS	39 PASSENGERS
*ECONOMY CLASS	49 PASSENGERS

*(20% Reduction of tourist)

Based on current European costs and revenues.

Of all the airliners only the Vanguard has all these features

425 m.p.h. cruising • Freight capacity 7/8 tons at normal densities • Full routeing and A.T.C. flexibility • Can use normal existing airfields • Quick turn-round • No airfield noise problems • Ten years' unique Vickers/Rolls-Royce turbo-prop experience . . . ***And it is 'Viscount' quiet.***

VICKERS VANGUARD

FOUR ROLLS-ROYCE TYNE TURBO-PROP ENGINES

• ***The airliner with the biggest profit potential ever offered to the operator***

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

TGA AT624

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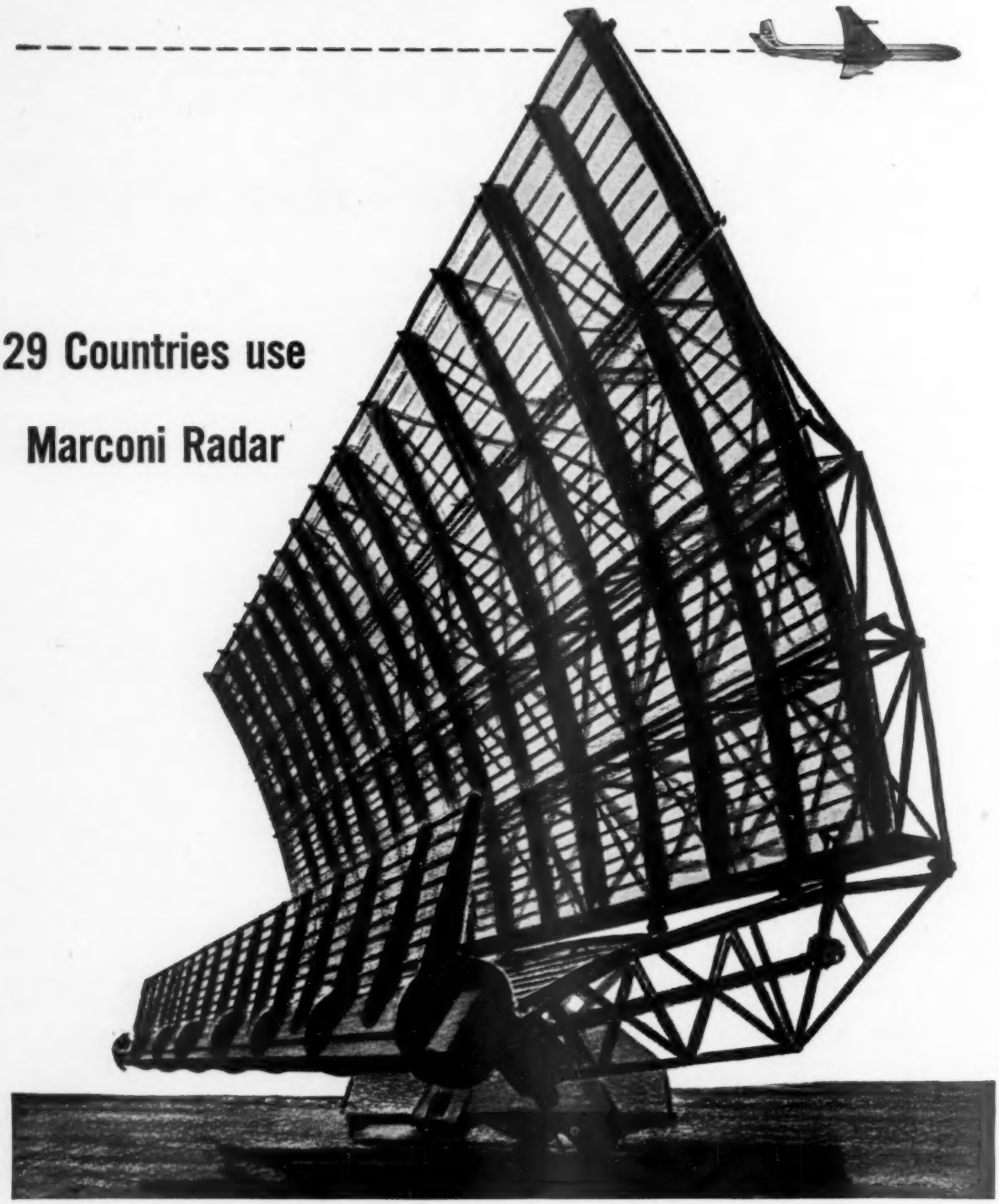
Marconi in Radar

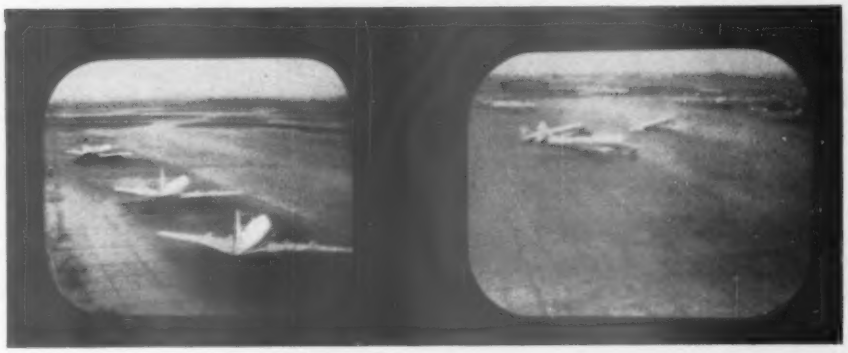


29 Countries use Marconi Radar

MARCONI COMPLETE CIVIL AND MILITARY RADAR INSTALLATIONS

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED, CHELMSFORD, ESSEX, ENGLAND

M 6R



TELEVISION MARSHALLING.—After six months of weather tests for the two exposed television cameras (Marconi BD871s), a closed-circuit system is now in experimental use at London Airport Central to help in the organization of apron movements. This photograph shows the two monitoring television screens which give the marshalling supervisor visual information about areas outside his direct line of vision and for which information formerly had to be obtained by R/T.

(*Continued from page 248*)

Ministry told the Treasury that charges for en route facilities would have to be introduced in future, but that it preferred for the time being to raise landing fees and other airport charges. These increases were expected to produce an additional £600,000 per annum.

Of the total deficiency, London Airport accounted for £2.1 million, though its revenue was about £3.8 million. The 15 airports which the Ministry hope eventually to be self-supporting cost, in all, some £5.4 million.

The Air-freight Business

WHILST plans were being made to transfer U.S. Military Air Transport Service route or "channel" traffic to the civil operators (see last week's issue, p. 216), Boeing have been busy proving that the use by MATS of turbojet freighters would make their operations very much more economical and efficient. A study has been made by Professors Stanley H. Brewer and Roger B. Ulvestad for Boeing's Transport Division and a summary report was issued earlier this month.

In this evaluation a Boeing freighter project (a 735 variant) is compared with six cargo aircraft in the existing MATS fleet over 42 actual routes and various load factors. Using an A.T.A. operating cost formula modified to suit military conditions, the minimum direct operating cost (including depreciation) of the 735 works out at 3.7 cents per ton-naut. mile by comparison with 5.37 cents for the most efficient aircraft in the MATS fleet —the Douglas C-133B Cargomaster. The Boeing "Cargo-jet" used for the comparison is not, incidentally, the swing-tail 735 being offered to the commercial airlines, but a similar aircraft with a gross weight of about 315,000 lb., an operating empty weight of 115,138 lb. and a maximum payload of 106,000 lb.

An interesting point arises in the matter of the economics of mechanized loading systems. About 3,500 lb. of such equipment must be deducted from the 106,000-lb. max. payload of the Cargo-jet. Assuming a cargo rate of 20 cents per ton-naut. mile, a revenue loss of more than $150 per flight hour must be accepted as the price of the airborne loading equipment. There is, too, a loss of 320 cu. ft. of cargo volume. But the saving in turn-round time might, in theory, increase earning power by as much as $10,000 per trip.

Assuming a utilization of 3,000 hr. per annum, the turbojet freighter can, the report says, produce 70 million ton-naut. miles in a year. U.S. military aircraft requirement for the fiscal year 1960 will be about 890 million ton-naut. miles. The theoretical requirement, therefore, would be for about 13 aircraft—but there must be many MATS operations for which the operation of the turbojet giant would be like using a hydraulic press to crack a nut.

Eastern Air Lines seems to have made one of the more sensible comments about the proposal that U.S. Government loans should be offered to operators for the purchase of modern freighters. "The mere fact that the loan guarantee is available," Eastern's spokesman is reported to have said, "would not create an air cargo market." Other opponents of the Monroney/Symington Bill are American Airlines, Pan American and Flying Tiger; approving operators and others include Northwest, National, ASA International, Slick and the Independent Airlines Association. Which is what might have been expected.

New Life for the DC-4

TO the operator's question "what shall we do with our piston-engined transports?" one answer heard with increasing frequency is "modify them for freighting." Many DC-3s and DC-4s are already fully engaged in this rôle, and the business of converting DC-6s, DC-7s and Constellations is growing. Recent examples have been the Pan American DC-7Cs converted by Lockheed Aircraft Service; similar conversions for American Airlines by Douglas; and the work done on Constellations by B.O.A.C. for Skyways' freight services.

For the most part, these and other conversions comprise the installation of large freight-loading doors and a heavy-duty floor. Although it is obviously better for obsolete equipment to be utilized in this way than to stand idle on the ground, the result can scarcely be regarded as an ideal air freighter, particularly so far as loading arrangements are concerned. This is why the Aviation Traders' conversion of the DC-4 has attracted such widespread interest from operators throughout the World.

First described in THE AEROPLANE AND ASTRONAUTICS for June 19, 1959, the A.T.L.98 is unique among freighter conversions in that it provides for nose loading as well as increasing the volumetric capacity of the freight hold. Taking a standard DC-4, Aviation Traders propose to remove the front fuselage as far back as the wing leading edge, and to substitute a new front fuselage which is 8 ft. 8 in. longer than standard. The new section has divided, outward-opening nose doors and, by having the flight deck raised 6 ft. 10 in. above the original level, provides a constant headroom of 6 ft. 9 in. into the hold.

The object of the conversion, as at first envisaged, was to provide a new car ferry for Channel Air Bridge, Aviation Traders' associated operating company. In this rôle, provision is made for five medium-size cars and 20 passengers to be carried at a cruising speed of 180 m.p.h. The aircraft thus has a better performance with a greater load than the Bristol 170s used at present on the vehicle-ferry routes. It will also be better suited for the deep-penetration ferry routes to European destinations for the operation of which the company hope to obtain permission next season.

It would be wrong to dismiss the A.T.L.98 as a specialized vehicle ferry, however, and present indications are that a good many DC-4 operators—and others—may be keen to obtain A.T.L.98 conversions for general freighting duties. For a comparatively modest financial outlay, this "face-lifting" operation provides an aeroplane of considerably increased flexibility, with better loading and load-carrying ability and operating costs of between 12d. and 14d./long ton-naut. mile over ranges from 400 to 1,500 naut. miles for annual utilizations of only 1,500 hr. As a car ferry, the direct cost of moving one "motorized unit" (car plus four passengers plus baggage) over 200 miles is £19 for a 14-ft. car and £23 for a 17-ft. 6-in. car.

Most interesting of all, perhaps, are the possibilities of applying similar conversions to the DC-6 and DC-7 series. Since all the Douglas family have a common fuselage diameter, very little redesign would be necessary to apply the new nose section for unpressurized operation. As a long-range freighter, a pressurized DC-7C conversion also appears attractive, and there is no reason in principle why the nose doors should not be sealed for operation at a comparatively modest differential of, say, 4 lb./sq. in.

Aviation Traders expect to fly the first of their conversions—now being worked on at Southend—during December, followed by a second in March, 1961. A flight test programme of some 200 hours should be sufficient to obtain a full British C. of A. in the unclassified performance group as a modified prototype. In round figures, the cost of conversion, including the purchase price of a DC-4, should be about £150,000, and an average time for conversion will probably be about three months. The actual time depends on the state of the aircraft to be converted, and assumes that the work will be done by Aviation Traders or by an equally well-qualified company using a kit of parts supplied by Aviation Traders.

Air Transport . . . .

This is Utilization

MORE than a decade ago those who were interested in such things began to notice the extremely high aircraft utilization figures being recorded in Australia. These were matched or exceeded by only a few airlines in North America. In that era an average of 3,000 hours per annum was considered to be high, even for aircraft such as the DC-4 which had been well bedded down in service and were flying medium-long-haul services.

The latest statistics for Australian operators—covering the year ended June 30, 1959, and collated by the Department of Civil Aviation—show very high levels even for some of the aircraft used primarily on short-haul operations. Among the top averages are, as might be expected, those for medium-long-haul aircraft such as the DC-6B, but there are figures well above the 3,000 mark for Convairs and one DC-3 (a freighter) logged 3,020 hours—or 8.27 hours a day.

The highest recorded average figures were those for aircraft in the Ansett/A.N.A. fleet. Five type groups exceeded 3,000 hours. These were the Lockheed Electra (3,258), two of which were in service for less than four months of the period; Viscount 747 (3,451); DC-6B (3,876); the Convair 340 and 440 (3,230); and the lone DC-3F mentioned in the paragraph above. In Trans-Australia Airline's fleet 13 Viscount 756s averaged 3,211 hours per annum each and Qantas Empire Airways' L-1049s averaged 3,297 hours.

The interesting feature of the figures is the very high overall average for the Ansett/A.N.A. and T.A.A. fleets. These have not been worked out by the Department, but our own calculations show that the former's fleet strength (excluding two Short Sandringham boats) averaged 28.71 during the year. The total flying hours (less the Sandringhams' and a Beaver's small contribution) were 74,700, so the average per aircraft unit was 2,602 hours per annum, or 7.1 hours per day. Similarly, T.A.A.'s average fleet strength was 36.47 and the total hourage was 89,302—giving an average figure of 2,449 hours per annum or 6.7 hours per day. It should be explained that the flying hours are calculated on a "chock-to-chock" basis and therefore include taxi-ing time—but, even so, the results are fairly remarkable when compared with those for most other airlines operating over networks in which the average stage distances are comparatively small.

UNITED.—As reported last week, Douglas and Sud-Aviation have joined forces to produce and market the Caravelle and to collaborate on other aviation projects. Mr. Donald Douglas Jr. and M.G. Hereil are seen together here after signing the agreement.

News from Israel

CONSTRUCTION of a new runway has been started at Lydda Airport, writes a correspondent in Tel-Aviv, to accommodate jet transports. It will be 8,860 ft. long initially, with extension to 9,850 ft. possible in due course. K.L.M. has announced its intention of training pilots for their new jets (Electras and DC-8s) over Lydda, because of overcrowding and bad weather during the winter around Amsterdam.

The consortium between B.E.A. and the Greek national Olympic Airways, our correspondent notes, will be launched when B.E.A. starts its five-times-a-week Comet service to Lydda in April. The first B.E.A. proving flight to Lydda was made in December, the Comet taking 35 minutes from Nicosia with a group of journalists and travel agents.

B.O.A.C. has resumed its flights to Lydda, which is now a transit stop on the twice-weekly Britannia service to Teheran, from London and Geneva. At Teheran, the services connect with Comet services to the Far East and Australia. T.W.A. has opened a Lydda-Rome service to link with its Boeing 707 flights to New York.

French Feeder-Liner

AS a private venture, Etablissements Henry Potez has started construction of a light turboprop feeder-liner. The project, the Potez P.840, is the first attempt by one of France's oldest and most respected constructors to re-enter the commercial aircraft field. Before the War, Potez transports, such as the three-engined P.403, the twin-engined P.62 and the twin-engined P.56, were used with success by Air France, Régie Air-Afrique and Potez Aéro-Service. The Potez 840, as the illustration shows, is an entirely conventional low-wing monoplane, not unlike the de Havilland Heron in size and appearance; it can be categorized as a Heron replacement.

The engines—to be lent by Turboméca for the prototype—are Astazou turboprops of 442 e.h.p. each, having a specific consumption of less than 0.66 lb./hr./e.h.p. Fuel (a total of 350 Imp. gallons) will be in integral wing tanks. The fuselage, of simple circular cross section, will be pressurized to a differential of 2.15 p.s.i. (8,200 ft. cabin altitude at 19,685 ft.). An interesting feature is the use of "Caravelle-type" triangular windows. High-lift double-slotted flaps will be fitted.

Accommodation will be for 16 passengers in the standard version or 24 in an economy-class layout with bench-type seats along the sides of the cabin. In both cases there will be a toilet and a baggage compartment at the rear, and another, unpressurized, baggage hold in the nose. The crew will comprise pilot and co-pilot/navigator and flight-deck equipment is expected to include a lightweight auto-pilot and flight director, twin VHF, VOR, ILS with radio-altimeter, and ADF.

The Potez 840 is designed to fly with its maximum payload of 5,500 lb. over ranges of about 540 naut. miles cruising at 270 knots at 20,000 ft. With maximum fuel, the payload is 3,250 lb. and the usable range is 800 naut. miles. The runway length required to comply with C.A.R.4b is 2,100 ft. at the maximum gross weight of 16,755 lb. With 16 passengers the weight is 15,390 lb. and runway length required is 1,770 ft. Landing distance from 50 ft. (unfactored) is 2,035 ft. at a weight of 15,270 lb. Dimensions are: span, 63 ft. 8 in.; length, 50 ft. 2¼ in.; height, 17 ft.; wing area, 376.7 sq. ft.

Design effort on the P.840 began in May, 1959, and the recent release of information on the project followed completion of wind-tunnel testing and construction of a mock-up.

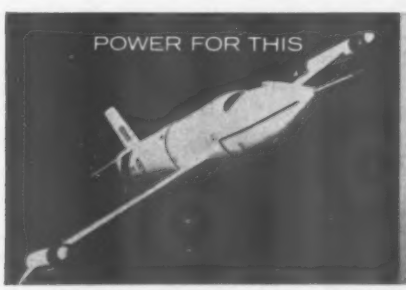
...AND BRISTOL SIDDELEY SUPPLY THE POWER

One of the largest manufacturers of motive power units in the world, Bristol Siddeley Engines Limited produce the Viper. A turbojet in the 1,700 to 3,000-lb thrust class, the Viper has proved itself in service to have those qualities which are particularly desirable in powerplants for trainer aircraft: great robustness and reliability, indifference to mishandling and a long overhaul life.

Illustrated above is the Hunting Jet Provost, the first jet to be standardised by any air force for primary training. The Bristol Siddeley Viper ASV 8 (1,750-lb thrust) gives the Provost a very lively all-round performance. When the Jet Provost Mk 1 began service trials with the RAF, over 1,500 hours were completed by nine aircraft in the first six months without a single premature engine removal!

That the Jet Provost is also a versatile aeroplane with plenty of "stretch" is well demonstrated by two later developments:—an armed version, in service with the Royal Ceylon Air Force and an advanced version powered by the Viper 11. The latter, which is under intensive development, has a greatly increased performance—a climb of 4,000 ft/min and a ceiling of 40,000 ft!

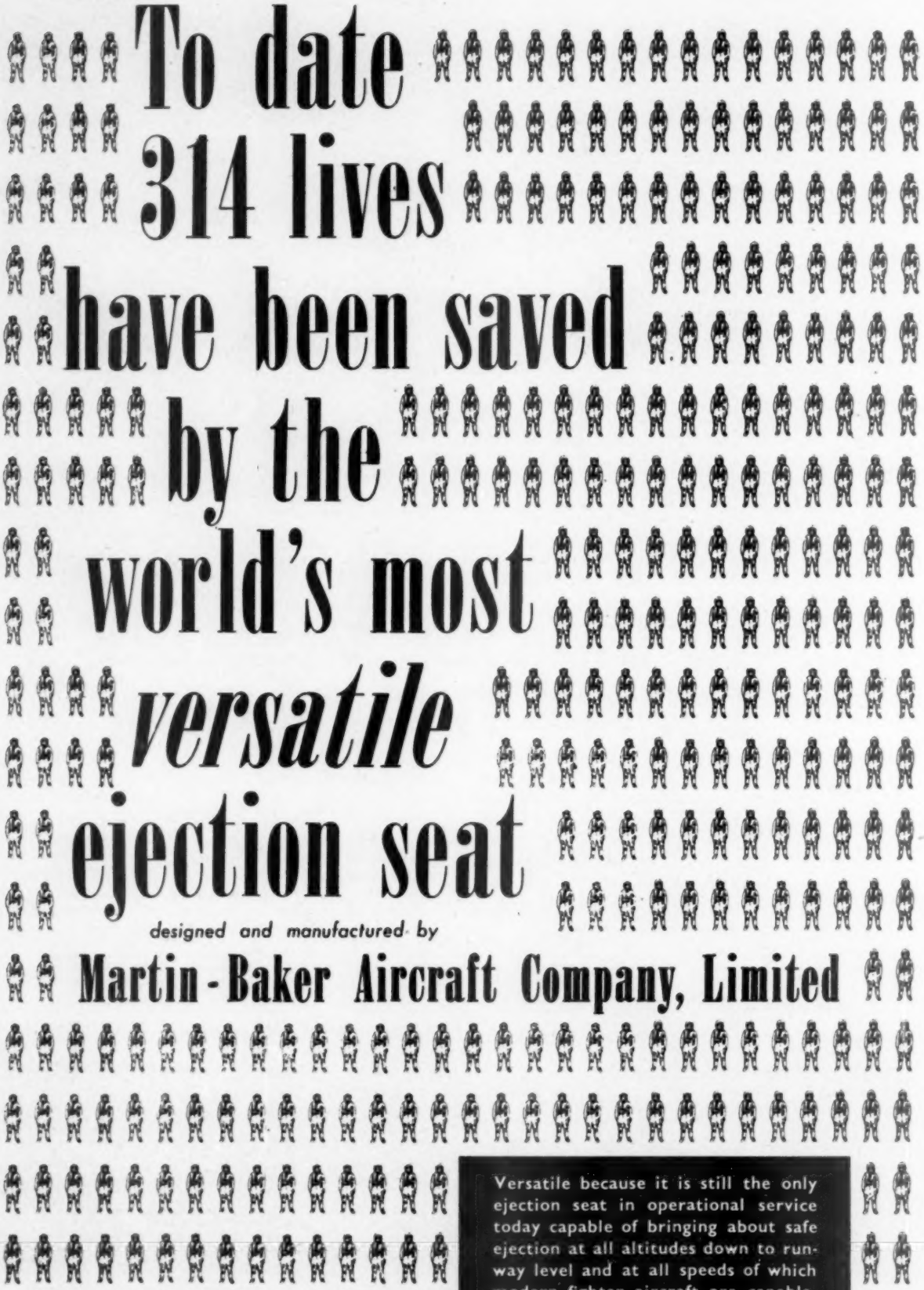
BRISTOL SIDDELEY ENGINES LIMITED



The Bristol Siddeley Viper 11 powers the Australian Jindivik Mk 3 target drone.

The Bristol Siddeley Viper 11 powers the Macchi MB 326 jet trainer.

The Bristol Siddeley Orpheus 100 powers the Folland Gnat trainer.



To date 314 lives have been saved by the world's most *versatile* ejection seat

designed and manufactured by

Martin-Baker Aircraft Company, Limited

Versatile because it is still the only ejection seat in operational service today capable of bringing about safe ejection at all altitudes down to runway level and at all speeds of which modern fighter aircraft are capable.

The Fighting Services

Aerobatic Teams for 1960

FOR the fourth consecutive year the senior R.A.F. formation aerobatic team will be No. 111 Squadron (Sqn. Ldr. Peter Latham), based at R.A.F. Wattisham. Fighter Command's reserve team for the coming year will be provided by No. 92 Squadron (Sqn. Ldr. R. H. B. Dixon), operating from R.A.F. Middleton St. George.

"Treble One" became the Command's reserve aerobatic team in 1956. Allotted the main commitment in 1957, it set the pace in aerobatics under the leadership of Sqn. Ldr. Roger Topp by adding a fifth aircraft to the conventional team of four. At the 1957 S.B.A.C. Display at Farnborough the team made another innovation by rolling and looping nine Hunters in formation, and in 1958 went one better and looped 22. Last year the Squadron gave over 50 major formation aerobatic performances in six countries before a total audience estimated to be three million strong.

Round the World

MEMBERS of the Inspectorate of Radio Services and other technical staff officers at Headquarters, Signals Command, left R.A.F. Benson on February 15 to inspect the signals facilities at Christmas Island and make liaison visits to the R.N.Z.A.F., R.A.A.F., and I.A.F. Travelling in the Command's Hastings, "Iris III," the party is headed by Gp. Capt. E. C. Passmore.

The Hastings, piloted by Flt. Lt. M. A. Sproule, is flying to Christmas Island via the Azores, Bermuda, Omaha and Hawaii, before going on to New Zealand. It will return by way of Australia, Singapore, Delhi and Karachi, arriving back at Benson on April 4.

SHAPE Appointment

AIR COMMODORE B. BALL, C.B.E., has relinquished the post of Command Signals Officer, Bomber Command, to become Deputy Chief Signals Officer at Supreme Headquarters Allied Powers Europe. In 1951 he was appointed Commandant and Chief Inspector of the Signals Division at R.A.F. Debden, and later went to the Air Ministry on Operational Requirements duties. He joined Bomber Command in December, 1956.

Safety Trophy Award

THE Royal Air Force has been awarded the Hunt Trophy for 1959, by the Guild of Air Traffic Control Officers, for its foresight in forming the United Kingdom Air Traffic Control Service. The trophy—a silver salver—was presented at the annual dinner of the Guild held in the Harcourt Room of the House of Commons on February 13.

Presented by Mr. K. I. Pearson, the Master of the Guild, who is senior controller at R.A.E. Farnborough, it was accepted on behalf of the Service by Air Cdre. H. J. Hickey, A.O.C., United Kingdom Air Traffic Control Service. The trophy was given to the Guild by Capt. V. A. M. Hunt, Director of Control and Navigation (Development and Planning) at the Ministry of Aviation, and is awarded annually for the most outstanding contribution to air traffic control made during the preceding year.

Leading the Field

ON February 12 the University of London Air Squadron became the first university air squadron (in fact, the first Service unit) to be visited by Air Chief Marshal Sir Thomas Pike since he took up his new appointment as Chief of the Air Staff. He was the principal guest at the Squadron's annual dinner at Imperial College, and commented that he had been well briefed by the previous C.O., Wg. Cdr. N. Cameron, who had told him that there are "other squadrons attached to a number of small-time universities."

Proposing the toast to the Squadron, the C.A.S. looked to the future and the next 10 years of Service flying—to the time when the number of strategical and tactical helicopters in Transport Command would be five times its present strength, with approximately 20 times the payload. He also stressed the important place that STOL machines have in military operations.

In a brief and lively speech the Squadron Commander, Wg. Cdr. V. Rees, welcomed the guests. He emphasized the support he had received from the University during his first year at London.

MALAYAN DEFENCE.—The two R.A.A.F. Sabre squadrons in Malaya should be equipped with Sidewinder AAMs this month. The missiles are being flown direct to their base at Butterworth from the United States.

Although no longer the masters of the art of "Hackmanship," the Squadron took the precaution of inviting to the dinner Air Cdre. J. N. H. Whitworth, Commandant of the Central Flying School, who now judge the Hack Trophy competition. Other Service guests included the Air Secretary, Air Chief Marshal Sir Theodore McEvoy, the Vice-chief of the Air Staff, Air Marshal Sir Edmund Hudleston, and Air Marshal Sir Arthur McDonald, Air Member for Personnel.

The Vice-chancellor, Mr. C. F. Harris, replied to the toast to the guests for the second year in succession, and N. A. Kearns, Royal School of Mines, completed the speeches by replying to the C.A.S.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Bomber Command: Gp. Capt. W. A. L. Davis, D.F.C., A.F.C., to Headquarters, No. 3 Group, R.A.F. Mildenhall, as Senior Officer in charge of Administration; Wg. Cdr. P. D. Squires, D.F.C., to R.A.F. Bassingbourn, to command the administrative wing; Sqn. Ldr. R. B. Phillips, D.F.C., A.F.C., to R.A.F. Cottesmore to command No. 10 Squadron, with the acting rank of Wg. Cdr.

Fighter Command: Sqn. Ldr. J. S. W. Bell to R.A.F. Patrington for Radio duties and Sqn. Ldr. G. E. McCullagh, A.F.R.Ae.S., to R.A.F. North Coates as Senior Technical Officer, both with the acting rank of Wg. Cdr.

Flying Training Command: Gp. Capt. J. N. C. Law, B.Sc., A.R.C.S., A.F.R.Ae.S., to H.Q. as Command Engineering Officer.

Maintenance Command: Wg. Cdr. A. W. G. Stuart to No. 11 Maintenance Unit, R.A.F. Chilmark, to command.

Signals Command: Sqn. Ldr. H. J. Lavery to Headquarters for technical planning duties, with the acting rank of Wg. Cdr.

Far East Air Force: Wg. Cdr. C. T. Nance, O.B.E., M.A., A.M.I.Mech.E., A.F.R.Ae.S., to Headquarters as Command Engineering Officer, with the acting rank of Gp. Capt.

R.A.F. Germany: Sqn. Ldr. W. J. L. Sheehan, D.F.C., to R.A.F. Sundern for planning duties, with the acting rank of Wg. Cdr.

Other Appointments: Gp. Capt. J. B. Coward, A.F.C., to Australia to command the R.A.F. Element of the United Kingdom Services Liaison Staffs; Gp. Capt. G. F. Rodney, D.F.C., A.F.C., to Ceylon as Air Adviser; Gp. Capt. A. F. Johnson, D.F.C., M.A., to the NATO Defence College as R.A.F. Instructor; Wg. Cdr. A. M. Brown, D.F.C., to the Directing Staff of the School of Amphibious Warfare; Wg. Cdr. G. Packe to Headquarters, Allied Forces Central Europe, for planning duties.

More Service News

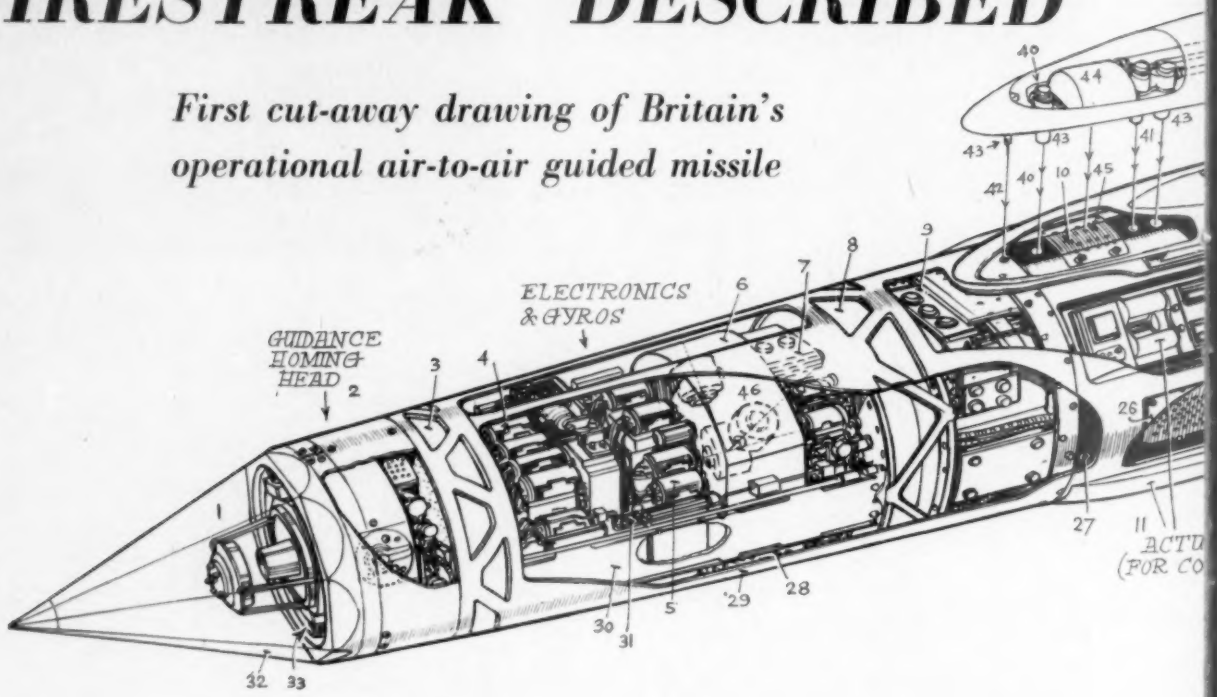
No. 600 Squadron Reunion.—The No. 600 City of London Squadron Association reunion dinner is to be held at the Duke of Yorks Headquarters on Friday, March 4. Tickets, price 12s. 6d. each, are available from Mr. K. W. Battrick, 2 Nursery Close, Orpington, Kent.

Victor Flight.—A Bomber Command Victor has made the 2,000-mile flight from the U.K. to Cyprus in 3 hr. 41 min. This new unofficial record is approximately 19 min. better than the previous time.

R.A.A.F. Move.—The R.A.A.F. Staff College at Point Cook, Victoria, is being transferred to the Australian Federal Capital, Canberra. R.A.A.F. bases at Rathmines, New South Wales, and Ballarat, Victoria, are to be closed down.

FIRESTREAK DESCRIBED

First cut-away drawing of Britain's operational air-to-air guided missile



NEW details of Britain's only operational air-to-air guided missile, the de Havilland Propellers Firestreak, were revealed by the company's chief engineer, Mr. G. H. F. Brown, in a lecture delivered in Bristol to the local branch of the Royal Aeronautical Society on Feb. 17. The comprehensive information contained in this lecture, together with the illustrations that went with it, now make it possible to show Firestreak in cut-away drawing form.

In the packed conference room at Filton House, he told an audience consisting largely of missile specialists from the Bristol company of the difficulties of developing the weapon. Described by one of his listeners as "a man who makes things work" he was obviously handicapped by security restrictions from saying all he would have liked.

The small size of Firestreak was the result of operational requirements. These were for the carriage of a number of weapons by an aircraft, and for suitability for different aircraft. An infra-red homing system was specified, and the vehicle was to have a short range. This determined the size of the collector mirror, and of the homing head and propulsion system.

The warhead was necessarily small, and so the requirements for accurate guidance and triggering of explosive were tight.

All the vehicle systems are housed in the front half. The rear half consists of an integral solid-propellent rocket-motor and the air bottle for the pneumatic system. This suggests the desirability of using a canard aerodynamic layout, but the unpredictability of the direction of roll resulting from aileron deflection ruled this out. The solution favoured and adopted was that of fixed wings and rear controls.

Each system is designed for ease of installation and removal when the missile skin is removed.

The optical unit in the infra-red homing system is mounted directly on the homing head gyro. This is simpler than other systems proposed for similar tasks, but involves higher gimbal inertias. To avoid incorrect guidance effects, high roll rates have to be avoided.

The power system consists of a small air-turbine-driven alternator whose voltage and frequency are closely controlled. Its output is fed to each system through a separate power pack. The tight frequency control permits it to be used as a sequence control.

Electronic components are anchored between printed circuits and sealed in a small can. Space between components is filled with resin. This gives good reliability, but suffers from the disadvantage that faults are difficult to rectify, and changes in the development stage are not readily made. Where sub-units are mounted on a chassis, they are dipped in varnish to provide protection against moisture and vibration.

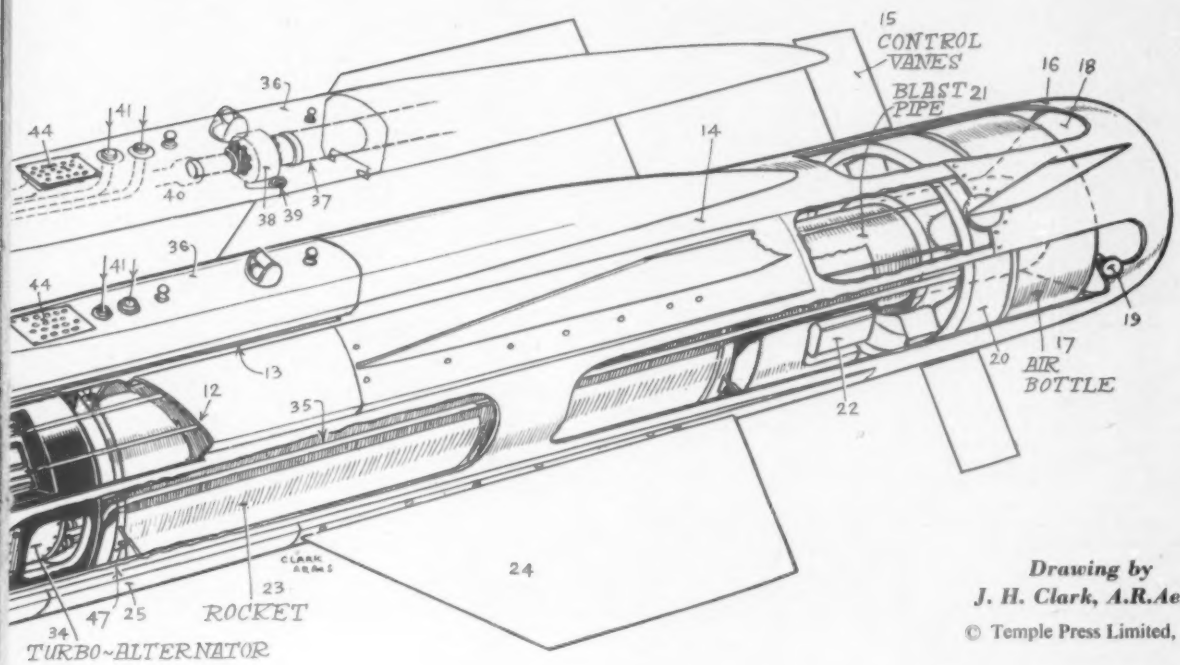
After the missile has been armed, some of the electronic components are cooled by ammonia from bottles in the rear of the launching shoe. Some components are cooled by allowing the ammonia to boil off in a heat sink on which they are mounted. Others are cooled by air from the parent aircraft passed through a heat exchanger in which ammonia boils off. The aircraft supplies hot air for heating mechanical components.

Guidance

The infra-red guidance system is frequency modulated. A chopper system ensures that the modulation is independent of the amount of energy received. In comparison with a reference generator, the phase modulation gives the direction of the target relative to the missile axis, and the frequency deviation the angular error relative to the optical axis. The error signals are amplified, and fed as DC currents to the torque motors operating the control fins.

The system is free from noise, and this permits use of a rapid response system. This aids the attainment of the small miss distance requirement.

The missile is launched on a pursuit course, straight at the target. The navigational system produces accelerations proportional to the rate of spin of the line joining the missile to the



Drawing by
J. H. Clark, A.R.Ae.S.

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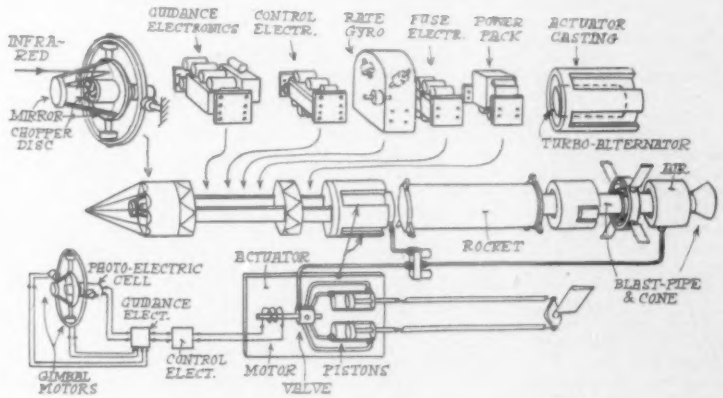
ATORS
NTROL VANES)



KEY

1. Mirror system.
2. Guidance homing head.
3. Front fuse assembly.
4. Guidance electronics.
5. Control electronics.
6. Rate-gyro unit.
7. Fuse electronics.
8. Rear fuse assembly.
9. Power pack.
10. Services plug.
11. Actuator assembly.
12. Control rods.
13. Mounting feet.
14. Rear body tube.
15. Control surface.
16. Tail cone.
17. Air bottle.
18. Blast pipe cone.
19. Bottle charging valve.
20. Control casting.
21. Blast pipe.
22. Warhead initiator.
23. Rocket motor.
24. Wing.
25. Front fairing.
26. Monitoring points cover.
27. Actuator casting.
28. Rotary convertor.
29. Front body skin.
30. Side rail.
31. Heat exchanger.
32. Glass nose.
33. Mirror system gimbals and motors.
34. Turbo-alternator (within 27) and air lines 35 from bottle 17.
36. Support shoe from aircraft.
37. Ammonia cylinder (insert nozzle into nut 38, then turn 38 via worm 39 to draw 37 into connection with pipeline 40).
41. Hot and cold air supplies.
42. Shear-bolt.
43. All these proud connections locate in missile and are sheared off at launching.
44. Services lines with butt connections 45.
46. Line of three gyros.
47. Rocket mounting-lugs to outer casing.

target. This system has been found satisfactory in spite of the drop in the weapon speed after rocket burnout.

The fins of the weapon are locked centrally at launch, and the guidance system demands are introduced progressively during the rocket boost phase. If this is not done, a violent acceleration oscillation occurs during flight.

To permit fitting to different aircraft in different attitudes, a zero-length launcher was considered unsatisfactory. The missile is launched from short rails, small feet on the missile running on rails in the structure of a launching "shoe" fixed to the aircraft.

A shear bolt retains the missile in position during the shocks of aircraft launchings and landings, but must be weak enough to release the missile when fired in cold conditions when the motor thrust will be reduced. Missile heating and cooling air are passed from the aircraft through shearable dowels.

Electrical services between launcher and missile pass through butt contacts.

In multi-missile installations launching is in sequence from alternate wings to cut down asymmetric drag. A hang up or misfire is allowed for in subsequent firings.

Fire control equipment indicates to the pilot when the target

The two Firestreak missiles carried on English Electric Lightnings for the R.A.F.'s Fighter Command are mounted low down on the fuselage side.

signal is strong enough to ensure locking on. The pressing of a button starts a sequence that includes transfer to the missile's electricity supply and ignition of the boost motor.

Test and Development

Several launching positions, including lateral ones, were tried. Winterization trials in Canada in which the system was completely coated in ice proved that it would work under such drastic conditions.

Aerodynamic development was carried out in ground launchings with a tandem boost rocket. This permitted the wings to be positioned.

Handling trials were conducted under the wings of a Sea Venom. Drop jettisoning was found to be satisfactory, but other techniques were necessary for some other aircraft.

Aircraft manufacturers were concerned about the possible influence of the missile on the behaviour of the aircraft's engine. Extensive tests and firings over wide ranges of conditions showed that the weapon was safe in this respect.

The Bristol/Ferranti test vehicle was used in the early development of the homing head. These tests pointed the way to the need for suitable ground test and laboratory facilities for work on noise, vibration, and temperature evaluation.

Firestreaks were ground launched at ground targets using the guidance system and with a battery of gas burners as a heat source. Further ground tests were carried out using a lightweight missile with tandem boost to reach high speeds and for the study of temperature effects.

It was established during carriage on aircraft that while spherical domes over the infra-red equipment collected ice, the pointed type was free of such troubles. A wide temperature variation occurred in flight inside the missile due to variations in operating speeds and heights. This made the heating and cooling systems necessary. The tendency now is to design away from this.

Air-to-air firing trials took place mainly in Australia to take advantage of good weather. The problem is to conduct the trials in such a manner that the operations take place over the designated instrumented area. The human element is important, and rehearsals are necessary to ensure success.

The need for routine testing in actual environments on aircraft in operational conditions was stressed by the lecturer. Some items that had been pronounced unreliable in ground tests were found to be reliable in airborne tests.

Discussion

MR. CORRICK (Bristol Aircraft): If the lecturer had the opportunity to think again, would he choose twist and steer instead of cruciform design?

MR. BROWN: It was difficult to say. One inevitably developed a preference for living with the beast one knew.

MR. FARRAR (Bristol Aircraft): Where should one strike the balance between aircraft and missile equipment in air-to-air systems? What would be the effects of noisy guidance on the weapon?

MR. BROWN: It is desirable to place the load on the aircraft rather than the missile, but that involves the aircraft people having a bigger say. Firestreak couldn't operate with noisy guidance.

MR. FISHER (Bristol Aerojet): Would a boost sustainer system offer advantages over the boost and coast system used in Firestreak?

MR. BROWN: Such a system would be heavier and more expensive. Otherwise it would be better.

MR. STRACHAN (Bristol Aerojet): Could Firestreak take advantage of more sophisticated fuels of higher performance?

MR. BROWN: Yes. This would lead to increased range. There were engineering difficulties, and therefore limits to what was practicable.

MR. LAWSON (University of Bristol): Would the speaker agree that overtesting was as bad as undertesting?

MR. BROWN: Sometimes he had authorized undertesting in order to get missiles fired. Overtesting was worse than undertesting. The problem was: What was enough testing?

In reply to a question put by MR. BIRKETT (Bristol Aircraft), MR. BROWN said that people were unreliable. Plugs were unreliable when people pulled them out of sockets. Self-separating plugs had been developed.

MR. ROBERTS (Smiths Aircraft Instruments): Encapsulation of electronic equipment is undesirable. Structures exist that are as good, and that are less wasteful.

MR. MASEFIELD, from the Chair, said he felt it was a horrid word anyway.

De Havilland Sea Vixens in service with the Royal Navy carry four Firestreaks pylon-mounted under the wings.

Photographs copyright "The Aeroplane and Astronautics"

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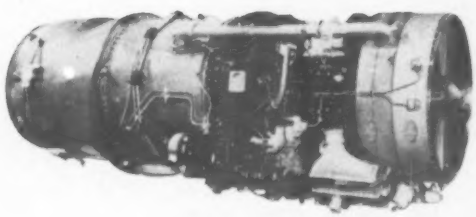
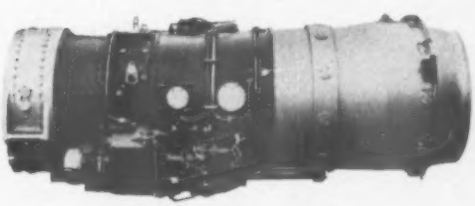
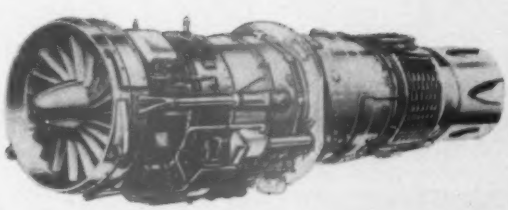


Conway by-pass jets will enter service this year in Boeing 707-420 and Douglas DC.8 jet airliners at 17,500 lb. guaranteed minimum thrust. The Civil Conway is being developed to powers over 20,000 lb. thrust with improved fuel consumption and will power the Vickers VC.10.

THE BY-PASS PRINCIPLE PROVED BY THE CONWAY IS NOW GENERALLY ACCEPTED AS THE CORRECT FORMULA FOR JET TRANSPORTS



The RB. 141 of 14,300 lb. thrust will power later versions of the Sud Aviation Caravelle.



The RB. 163 of 10,100 lb. thrust has been chosen to power the Airco DH.121.

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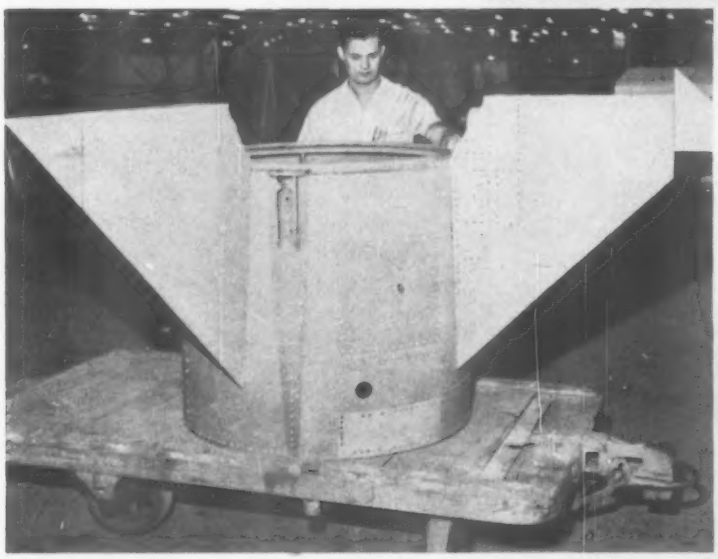
Satellite Launcher

Details of the American Chance Vought Scout, the four-stage, all-solid rocket that is expected to put Britain's first satellite into orbit in 1961

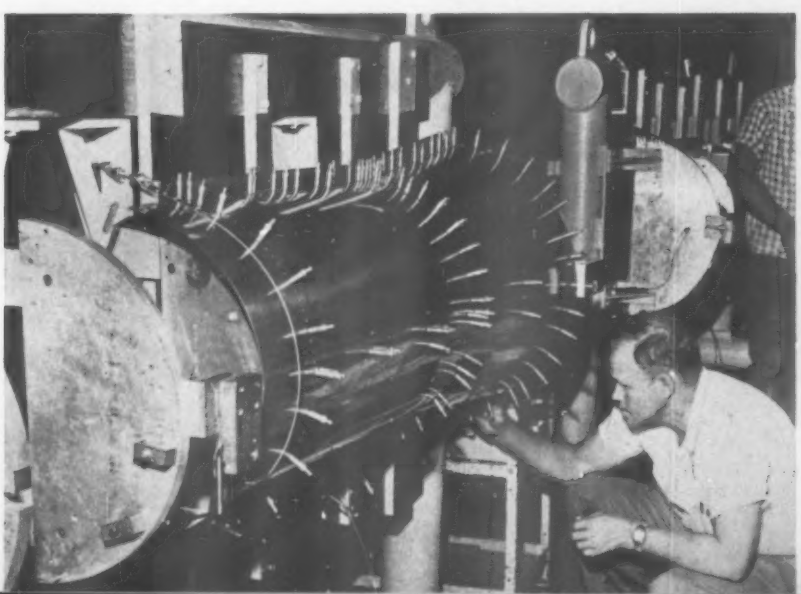
Above, the "payload collar," which is attached to Scout's fourth stage and goes into orbit; it is gold-coated for temperature control.



Above, tail-fin assembly which is bolted to the Aerojet-General first stage. Movable fin tips are connected by rods to exhaust vanes which impinge in the rocket efflux.

Below, one of the partly assembled, all-steel, tail fins; note the rigid aircraft-type structure.

Below, within this stainless-steel two-piece "heat-shield" at the nose of the rocket will fit the ABL X.248 final stage, with three spin rockets in the flared skirt.



Above, installation of the "ballistic actuator" which will eject the nose-fairing and expose the satellite payload; it will also release pins causing separation of the lower heat-shield and flared skirt.

A British Rocket for the U.S.

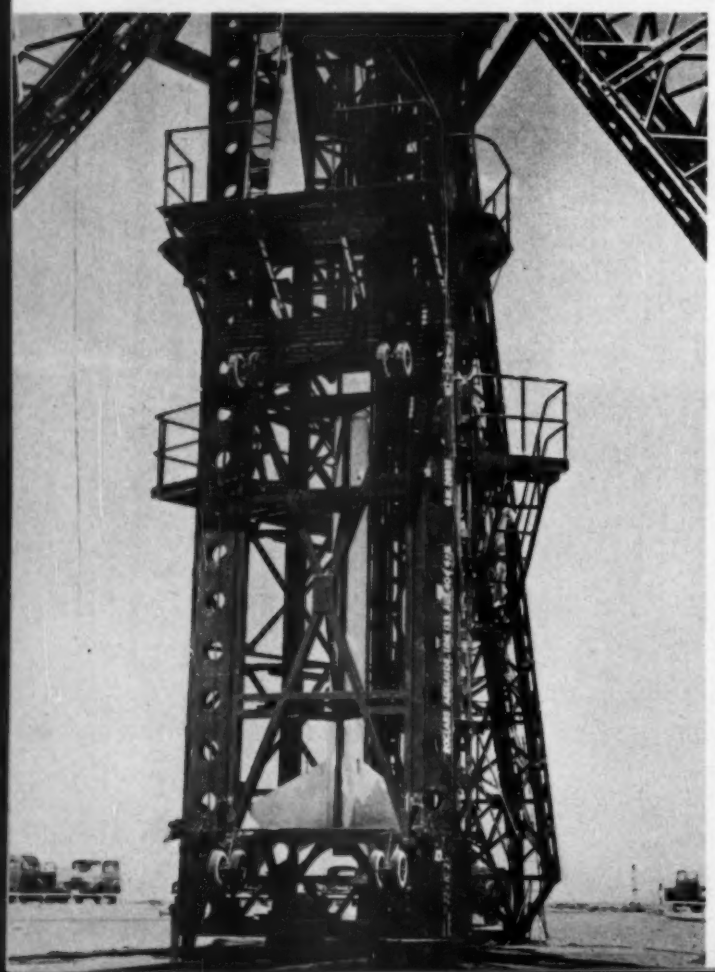
PLANS to use British Skylark rockets to send American-built instruments 100 miles into the upper atmosphere, were announced in Washington on Feb. 16. It is proposed that Australian personnel shall launch the rockets from Woomera. The Ministry of Aviation have confirmed that representatives of the U.S. National Aeronautics and Space Administration will soon be visiting this country to discuss the purchase of the necessary rockets.

The tentative arrangements were revealed by Mr. Arnold Frutkin, director of international programmes of NASA who gave the information before a meeting of the International Defence Board. "NASA," he said, "considers that a very wide range of co-operative activities is in prospect and it is the administration's intention to encourage these most energetically."

Britain, as has been extensively reported, is taking advantage of an American offer for the launching of satellite instruments by the Chance Vought Scout four-stage rocket in a programme beginning in 1961.

Although the Americans possess efficient high-altitude rockets of their own, they wish to carry out upper air reseach at different latitudes to obtain comparative results, and Woomera is considered an ideal location. It is natural, therefore, that NASA should wish to take advantage of the excellent facilities for this work already available at Woomera.

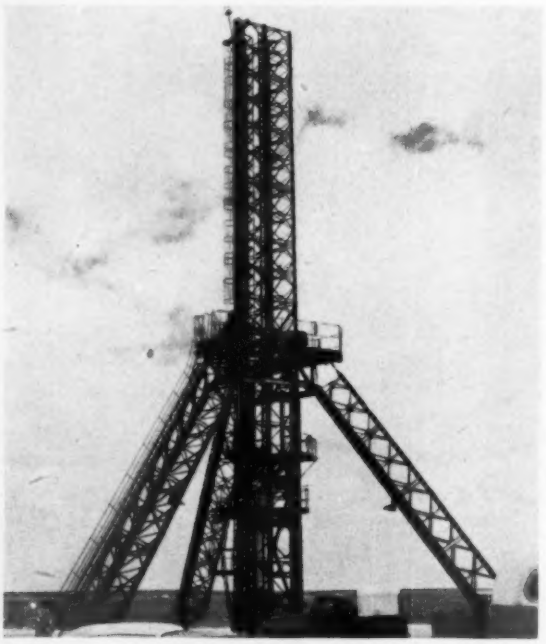
The Skylark launcher takes the form of a lattice tower 81-ft. high, which is pivoted near its centre from a triangular mounting, the tripod legs being 62-ft. apart; the mounting permits a limited degree of elevation and traverse. The pivot arrangement allows movement between 15-deg. forward of the vertical in elevation and 10-deg. either side. Remotely controlled motors situated on the pivot frame allow easy adjustment of the tower.



Fabricated largely of Bailey-bridge panels, the complete structure weighs 35 tons. A feature of the launcher is a self-loading cradle which receives the rocket on its delivery trolley and swings it on to the lift well for raising to the firing position.

The nose section of the rocket containing the instruments is fitted with the vehicle in the upright position by means of servicing platforms situated around the mid-section of the tower.

Skylark was originally developed in 1956 by the R.A.E., Farnborough, according to a specification laid down by the



Skylark No. 3 was launched on July 23, 1957. The three pictures, left to right, show the instrumented nose-cone being got ready on the servicing platform, the launching tower 81-ft. high, and the moment of firing.

Gassiot Committee of the Royal Society.[1] Essential particulars are given in Table 1, but later versions of the rocket have slightly improved performance.

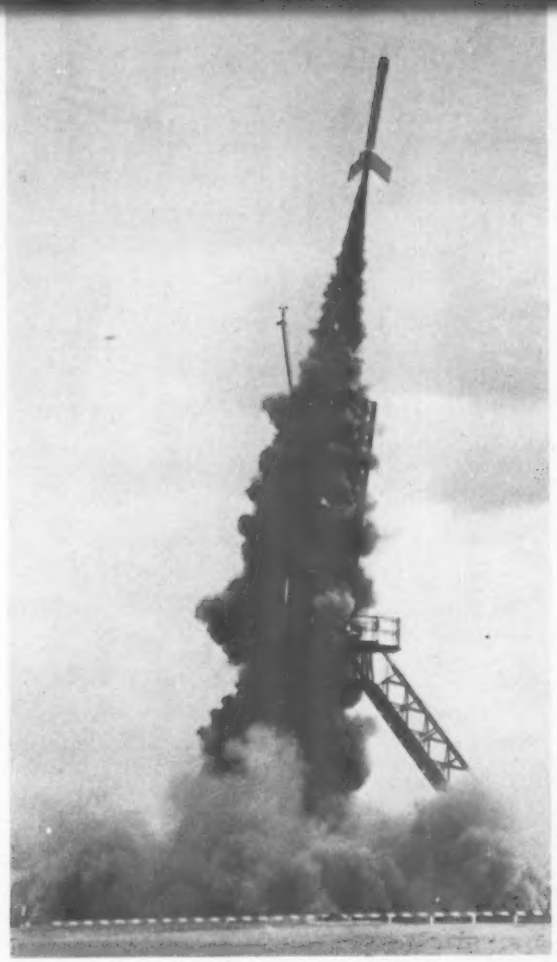
The 12,000-lb.-s.t. Raven rocket motor is larger than any previously made in this country. Developed by the Banwell Division of the Bristol Aircraft company (now Bristol Aerojet, Ltd.), in association with R.P.E., Westcott, it has a burning time of about 30 sec.

The motor case, made from chrome molybdenum steel, has a nominal wall thickness of 0.14 in. and withstands a test pressure of 1,420 lb./sq. in. It is manufactured either by wrapping and welding sheet steel or by welding together lengths of drawn steel tube. The head and rear ends of the motor, machined from forgings, are welded to the body; the venturi is formed as a high-pressure moulding in Durestos, a phenolic resin-impregnated asbestos.

Skylark experiments have been devised and instrumented by various universities in the United Kingdom with good success (Table 2).

Among recent firings were three originally scheduled for International Rocket Week 1959, a programme of simultaneous firings co-ordinated by the International Committee on Space Research (COSPAR) between Nov. 16 and 22. Unfortunately bad weather delayed the British firings, but all three rockets were successfully launched between Nov. 30 and Dec. 1. The

[1] Gatland, K. W. Rockets and artificial satellites in the I.G.Y., "Space Flight." July, 1957.



principal experiments conducted with these vehicles are set out hereafter.

The Queen's University of Belfast prepared equipment for the ejection of a sodium vapour trail for wind and temperature measurements. The trail, formed between about 40 miles and 90 miles above the Earth, shortly after sunset, was photographed through a Fabry-Perot interferometer so that its temperature might be measured from the fringe profile. Wind information was obtained from photographs of drift trail.

University College, London, equipped rockets for grenade bursts, to provide wind and temperature measurements by an alternative method. Two of the vehicles carried grenades, the bursts of which were recorded by a ground array of microphones and cameras.

Measurement of electron density was the province of the University of Birmingham using a dielectric method. An earlier Skylark firing in June, 1958, had indicated that a narrow sporadic "E" layer may exist at about 60 miles and this appears to have been confirmed. The method involves the use of positive ion spectrometers which are ejected from the rocket on a long cable to record ion spectra at heights ranging from the lower ionosphere to approximately 93 miles.

Finally, there were measurements of the drift of clusters of resonant dipoles, with apparatus provided by the Department of Meteorology, Imperial College, London. This involved the radar tracking of clusters of aluminium foil strips released from one of the rockets, providing data on upper atmosphere wind conditions.

In view of the interest of the Americans in Skylark, it may be of interest to compare some of the experiments which they proposed for last year's International Rocket Week.

NASA scheduled two Nike-Asp firings from Wallops Island, Virginia; one to measure upper atmosphere winds at altitudes up to 150 miles; and the second to measure solar X-ray and Lyman-alpha emissions. Two five-stage rockets by the Army Ballistic Research Laboratories were to measure charge densities in the upper atmosphere between 50 and 1,000 miles.

Two Nike-Cajan rockets were to be sent up from Fort Churchill by ABRL laboratories, in co-operation with the Government of Canada and Canadian scientists. These were to determine water vapour content of the atmosphere between altitudes of 18 to 60 miles.

At Fort Churchill also, the Air Force Geophysics Directorate proposed to send a magnetometer aloft in an Aerobee, while at Elgin Air Force Base, Florida, two rockets were instrumented for micrometeorite studies.

An Aerobee was also to be launched by the Naval Research Laboratory from White Sands, New Mexico, for the purpose of recording, with high resolution, a portion of the solar spectrum.

Results of all these experiments, including the British, were still being analysed at the time of the recent COSPAR Symposium in Nice. At the time of writing, it is not clear which particular experiments the Americans hope to make with Skylark rockets at Woomera but clearly there is a wide range of opportunities.

TABLE 1. SKYLARK I

Length ..	25 ft.
Diameter ..	17.4 in.
Weight, launching	2,560 lb.
Weight, payload	65 to 150 lb.
Payload volume	65-in. long nose-cone providing 2.7 cu. ft. 30 in. parallel under-bay providing additional 2.3 cu. ft. (Both sections independently pressurized).
Telemetering transmitter	AM/FM 465-Mc/s. (providing 100 readings per sec. from up to 24 instruments).
Thrust ..	12,000 lb. for 30 sec. (solid-propellent Raven motor).
Velocity, cut-off.	Mach 5.0 (at approx. 70,000 ft.).
Altitude, maximum	93 miles (with 65-lb. payload).
Launcher ..	81-ft. tower.

NOTES.—Raven motor first static fired at Westcott on August 3, 1956; first trial launching of Skylark at Woomera, less instruments, low-angle trajectory, February 14, 1957.

TABLE 2. LIST OF FIRINGS

Firing order	Rocket No.	Date	Altitude (miles)	Remarks
1	1	Feb. 14, 1957	7	First test firing, low-angle trajectory, no research instruments.
2	2	May 22, 1957	47	Test firing.
3	3	July 23, 1957	53	Test firing with telemetering check on instruments.
4	4	Nov. 13, 1957	77	Test-firing, but fully instrumented, including grenades, radar "window" and dielectric experiment.
5	6	April 2, 1958	—	Propulsion test (R.A.E.).
6	7	April 17, 1958	91	First Gassiot and IGY firing. Ejected grenades and radar "window."
7	5	May 20, 1958	94	Test firing, but instrumented for airglow measurement. Nose-cone separated.
8	18	June 18, 1958	—	IGY night firing. First motor failure.
9	9	June 19, 1958	90	IGY night firing. Successful dielectric experiment of electron density.
10	8	Sept. 19, 1958	97	Fourth Gassiot firing. Grenade, "window," dielectric experiments. Telemetry failure.
11	11	Dec. 3, 1958	79	Fifth Gassiot firing. Sodium vapour experiment.
12	10	April 6, 1959	—	Unsuccessful.
13	14	July 8, 1959	58	Carried ion-probe and X-ray plates.
14	17	Aug. 19, 1959	90	Carried ion-probe, etc.
15	12	Sept. 17, 1959	83	Carried "ion-cage" (instrument ejected on return path). Nose-cone separated.
16	15	Sept. 24, 1959	100	Repeat experiment of above. Complete success. Nose-cone separated.
17	16	Nov. 30, 1959	97	Sodium vapour experiment. Trail produced above 40 miles (see article).
18	60	Nov. 30, 1959	about 100 (analysis not completed)	Ejected grenades and radar "window" (see article). No tracking beacon fitted.
19	38	Dec. 1, 1959	100	Ejected grenades and "window." Also dielectric measurement of electron density (see article).

In addition to the above, there have been a number of firings specially instrumented by the R.A.E. Rocket No. 13 has not yet been fired; instrumented nose-cone was shown at recent COSPAR Symposium in Nice.

Defence and Service Estimates

THIS year's Report by the Minister of Defence, published as a White Paper*—some of the principal points of which we briefly mentioned in our previous issue—was notable primarily for its emphasis on mobility in relation to the launching of deterrent weapons. This indication of a considerable change of thought regarding the vulnerability of the static underground launching sites chosen for Blue Streak can no doubt be taken as a reflection of the impression made on our defence planners by the remarkable degree of accuracy demonstrated with Russia's ballistic and satellite devices during the past 12 months.

Thus, although the White Paper makes it clear that development of the de Havilland Propellers Blue Streak long-range ballistic missile will continue, it makes the significant comment that in considering a successor to the bomber-launched stand-off bomb it *may* be decided [our italics] not to rely exclusively on fixed-site missiles. Investigations, it says, are proceeding into the possibilities of using aircraft or submarines as mobile launching platforms for weapons with nuclear warheads.

Deterrent Possibilities

For the future, then, there are likely to be three contenders for the distinction of being the principal deterrent weapon. Of these, it would appear that Blue Streak with its fixed launching site and consequent vulnerability is not now so highly favoured. It seems quite clear, however, that work is to go on. There is increasing evidence of the determination to use Blue Streak to launch a British satellite.

As a possible alternative, some form of air-launched ballistic weapon would certainly find favour with the R.A.F., for this is a logical development beyond the stand-off bomb. It provides another demonstration of the longevity of manned military aircraft.

In this context there has been mention recently of the possibility of our using the American Skybolt missile (THE AEROPLANE AND ASTRONAUTICS, February 12), which has a range of around 1,000 miles beyond its launching point. It should not be overlooked, however, that the areas needed for take-off of launch-aircraft for Skybolt are not likely to be any less vulnerable to attack than the Blue Streak sites.

This is one of the arguments brought forward by the protagonists of a major naval deterrent weapon in the form of a submarine-launched missile such as the American Polaris. In this case the launching platform has the advantage of effectively greater mobility and the areas from which its missiles can be fired are more extensive, with a correspondingly smaller degree of vulnerability. The Minister's Report, however, gives no indication of preference—or, indeed, likelihood of the adoption of such techniques—other than to say that the possibilities are being investigated.

The White Paper discloses the expected placing of an order for a second nuclear submarine—with a British powerplant—next year. This is not, however, planned as a missile launcher but is for the "killer," or anti-submarine, rôle.

It is interesting to note here that attention has been drawn by the First Sea Lord to an underwater noise problem that is associated with the nuclear submarine. This makes such craft more liable to detection than the latest British conventional submarines, which are said to be second to none in respect of their silent underwater movement.

Another disclosure of the White Paper in relation to ballistic missiles was that arrangements were being made with American authorities for the provision of a ballistic-missile warning system for the U.K. This formed the subject of a separate statement in the House of Commons on February 17, by the Secretary of State for Air.

For the present, the V-bomber force remains as the main contribution by the United Kingdom towards the strategic nuclear power of the West. It is now, of course, supplemented by the Thor surface-to-surface guided missiles that recently came into operational service with the R.A.F. (see THE AEROPLANE AND ASTRONAUTICS for February 19).

The White Paper gives no new information about the V-bombers, but stresses the better take-off performance of the Mk. 2 versions of the Vulcan and Victor, and their capability of flying farther at greater heights. Flight refuelling is mentioned as a means of increasing their range still farther and it is emphasized that the readiness of the V-bombers in this country will be improved and their dispersal increased.

This, presumably, is a reference to the need for short "scramble" times in the light of the short warning that is likely to be given of missile attack. Even with the aid of the new warning radar in Yorkshire, there would only be a few minutes' notice of the arrival of a missile fired from, say, East Germany.

The Minister reports that measures are to be taken to make it "operationally easier" to deploy the V-bombers overseas. He gave no details of this, but the Secretary of State for Air, in presenting the Air Estimates, referred to the extensive programme of overseas visits and training flights undertaken by Bomber Command's Vulcans and Victors, and said that these flights provided invaluable exercises in mobility.

According to the White Paper, defence expenditure for 1960-61 is estimated to be about £116 million more than for 1959-60; the actual figure, allowing for the receipt of a £12 million contribution by Germany towards the local cost of British Forces in Germany, is £1,617.83m., compared with £1,502.13m. for last year. The Air Ministry's portion of the total is the highest at £527.46m., with the War Office next at £477.45m. and the Admiralty at £397.5m. For the Ministry of Aviation there is a £198.85m. allowance.

As we recorded last week, 49% (about £792 million) of the total is estimated for spending on Service personnel and civilians working for the Forces; 14% (about £227 million) for future weapons, research and development; 28% (about £453 million) for weapons and equipment for use now; and 9% (£146 million) for miscellaneous expenditure. A large part of this budget, the White Paper adds, is to be spent on services which cannot be curtailed at short notice.

"A principal aim of the Five-Year Defence Plan introduced in 1957," it goes on, "was to give stability to the defence programme and so to avoid wastage both of effort and expenditure. This remains the Government's policy. None the less, adjustments in long-term plans cannot be avoided in a World in which the rate of progress of science and technology is always accelerating, and in which the international scene is constantly changing."

In point of fact, it is made clear right at the beginning of the Report that the situation cannot be expected to remain static. Our defence effort must, it says, be flexible, since the threat of war takes many and changing forms, and it must be expected that there will be shifts of emphasis from time to time to meet changing circumstances.

Increasing Skills

The Minister is at pains to explain the increasing complexity of modern weapons and cites as examples the fact that a modern V-bomber needs some 140 kW. of electrical power for its equipment, compared with the 5 kW. of the Wellington; and that the air defence system of H.M.S. "Hermes" contains about 9,000 valves, as against fewer than 500 in the warning system of H.M.S. "Illustrious." In consequence, he says, there is now a greater need than at any previous time for Service personnel servicing and maintaining this sort of equipment to possess scientific and technical knowledge and skill. Each year the Services send about 200 officers and officer cadets on degree-standard courses in science and engineering. This represents about 25% of the total annual officer-cadet entry.

Here it might be added that, according to the Report, by the end of the current Five-Year Defence Programme, British Service manpower will have been reduced from nearly 700,000 to around 400,000. In the smaller all-regular forces the

(*Continued on page 259*)

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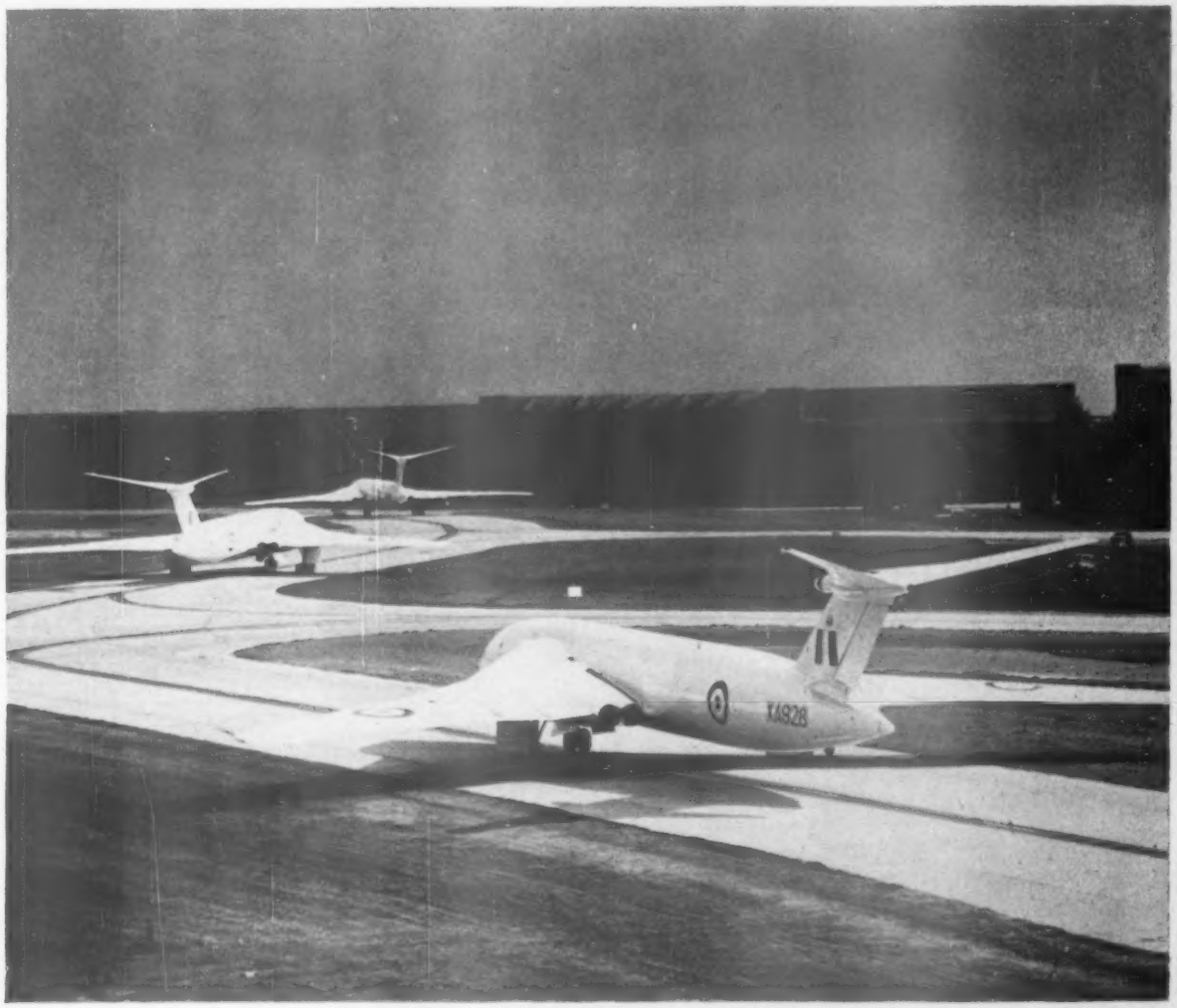
	April 1, 1959 (actual)				April 1, 1960 (estimate)				April 1, 1961 (estimate)			
	Royal Navy	Army	R.A.F.	Total	Royal Navy	Army	R.A.F.	Total	Royal Navy	Army	R.A.F.	Total
Regular	95.8	172.9	142.3	411.0	93.5	159.9	139.9	393.3	92.7	166.6	142.9	402.2
National Service	2.2	125.0	26.0	153.2	0.7	99.6	18.7	119.0	0.3	57.0	13.7	71.0
Women	3.6	6.0	4.9	14.5	3.7	6.3	5.7	15.7	3.6	6.5	6.4	16.5
Total	101.6	303.9	173.2	578.7	97.9	265.8	164.3	528.0	96.6	230.1	163.0	489.7

Service manpower in thousands.

VICTOR

"FLIGHT" Photograph



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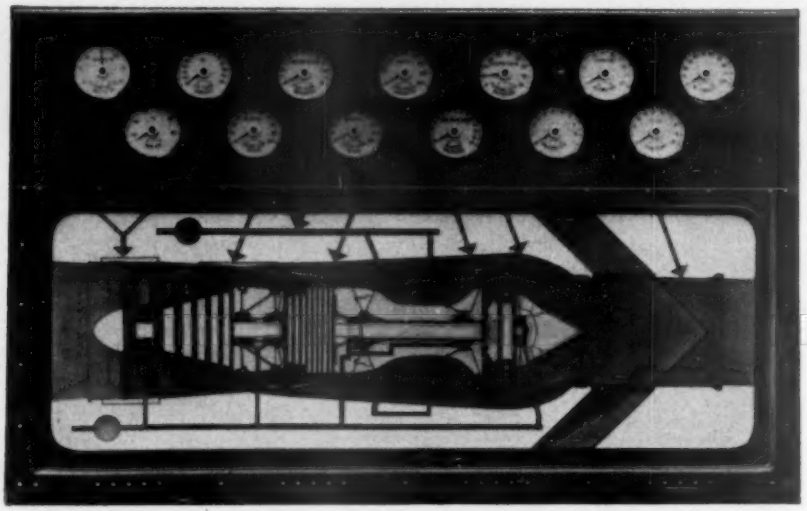

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(*Continued from page 258*)

individual will have to "work, train and fight at maximum efficiency."

The active strengths of the three Services are compared in the table on the preceding page.

Works study and allied techniques, the Report explains, are being used on an increasing scale in all three Services. Studies in aircraft servicing in Bomber Command, for example, have increased aircraft availability by 10% and resulted in a higher utilization of manpower. The time taken to refuel, reload and check a Fighter Command Hunter has been halved and the number of men needed for these tasks reduced by a third.

In its review of current weapons and equipment for the Services, the Report underlines the large part played by the Government's research and development establishments in all defence research work. Indeed, it is said quite categorically that the maintenance of the strength of these establishments is a vital feature of the defence plan.

Of the Army's air equipment, mention is made of the Australian Malkara anti-tank guided missile which has been adopted for British forces. For anti-aircraft defence, the English Electric Thunderbird Mk. 1 has been adopted as the Army's first surface-to-air weapon and is "now coming into service." No mention is, however, made in the Report of later developments of Thunderbird, which are known to be proceeding and were mentioned in last year's White Paper.

The Report also refers to the Canadian de Havilland Beaver, which has been chosen as a light liaison aircraft for Army support duties, but it does not have anything to say about Army helicopters for such duties. In a later section, though, reference is made to the provision of helicopters for the quick movement of troops within a tactical area, mentioning in this context the development contract for the Rotodyne; a new order for Whirlwinds; and development of a "more advanced type" of helicopter. The commando carrier, H.M.S. "Bulwark," which has just joined the Fleet, can carry one Royal Marine commando—equivalent to an infantry battalion—together with helicopters, landing craft and vehicles.

The current situation in Naval aviation is that the aircraft carrier H.M.S. "Eagle" is being modernized and the new carrier "Hermes" is about to join the Fleet. The striking power of the Fleet has been "greatly increased" by the entry into service of the Scimitar single-seat day fighter/strike aircraft and the Sea Vixen two-seat all-weather fighter which mounts Firestreak air-to-air guided missiles. For the future, the Blackburn NA.39 two-seat strike aircraft has been ordered.

No new information is forthcoming about the Navy's guided weapons. Trials of the Seaslug anti-aircraft ship-to-air missile and of the Seacat ship-to-air missile for defence against low-level aircraft attacks "have continued successfully." The Report also states that construction of the "County" class ships, which are to be the Navy's missile carriers equipped with Seaslug, is "proceeding well."

So far as R.A.F. aircraft developments other than the V-bombers are concerned, the White Paper reports "considerable progress" with the detail design of the new T.S.R.2 strike and reconnaissance aircraft, which is the responsibility of the Vickers-Armstrongs/English Electric team. The Lightning is now being flown by R.A.F. pilots and will enter regular squadron service "within the next few months." And the Gnat Trainer is being developed for advanced jet training.

A second squadron of Britannias is planned to come into service before the year is out. The strategic transport force will be further strengthened in due course by the Britannic transport. And the tactical transport force will be "fortified" when deliveries of the military version of the Argosy—now on order—begin.

The Report mentions Bloodhound as being deployed in service with the R.A.F. and adopted by Australia and Sweden as a surface-to-air anti-aircraft defence weapon. At Woomera the programme of guided-weapons development has included tests with Firestreak, Thunderbird, Bloodhound, Seaslug, Malkara, Blue Steel and Blue Water; and with the Black Knight and Skylark research vehicles.

Presenting the Air Estimates

Much of that part of the Defence White Paper dealing with R.A.F. equipment was covered also in the Memorandum provided by the Secretary of State for Air to accompany the Air Estimates presented to the House of Commons last week. In this, for example, he says that the Vulcan 1 squadrons are complete and that the last Victor 1 squadron is scheduled for formation "early this year." The Mk. 2 Vulcan will enter service during 1960-61 and the Mk. 2 Victor—the prototype of which was lost last August—will enter service next year. The Secretary of State refers to the T.S.R.2 as having a designed take-off performance, range, speed and comprehensive equipment which promise to make it an outstanding aircraft both in Europe and elsewhere.

In Fighter Command, the Lightning and some Javelins are being fitted with in-flight refuelling equipment, and this, it says, will greatly facilitate rapid reinforcement of overseas theatres. Bloodhound's capabilities have been confirmed in trials and in operational deployment during the year and more operational stations having Bloodhounds will come into service in 1960-61.

It is interesting to note that the Secretary of State refers to the Ballistic Missile Early Warning station under the Fighter Command heading. In the statement made to Parliament on this subject all that was said was that it would be commanded by the R.A.F. No precise information about the time it will come into operation is available; but it is said to be of the order of two to three years away.

On the subject of Coastal Command, the Memorandum recalls that during 1959 the working arrangements between the Command and the Royal Navy were reviewed. It had been decided that the shore-based maritime air forces would continue to form part of the R.A.F. Coastal Command would continue as a separate R.A.F. Command.

From January of this year, however, the senior Naval Commander in each area at home and overseas will decide the operational tasks on which Coastal Command aircraft are to be employed when engaged in maritime operations or exercises and will issue the necessary orders to the senior Air Force Maritime Commander concerned.

In Germany, re-equipment of the all-weather fighter squadrons with Javelins is, the Memorandum says, practically complete. It has been decided to defer the withdrawal of certain fighter squadrons from the Second Allied Tactical Air Force; and it is planned to withdraw the Swift from service in the fighter-reconnaissance rôle and to replace it with a fighter-reconnaissance version of the Hunter.

A highlight of the Air Estimates is the new officer career structure which is being introduced in the R.A.F. on April 1.

H.M.S. "Hermes," the Royal Navy's latest aircraft carrier was mentioned in the White Paper on Defence as being equipped with the latest air defence and control arrangements and about to join the Fleet.

Closely linked with the new Service pay rates, which also come into force on the same date, it includes a revised retired-pay code that increases progressively with rank and length of service, from a minimum of 16 years after the age of 21 up to a maximum of 34 years.

Under the new structure, officers on the General List will no longer be obliged on manning grounds to retire in their forties and early fifties. In future, they will be offered from the outset the assurance of a career to the age of 55, with an option to leave with retired pay at the age of 38, or on qualifying for pension after 16 years' service, whichever date is the later. They will also have the right to apply for voluntary retirement once they have passed the relevant option point.

This new career structure will apply to officers awarded General List permanent commissions on or after April 1. It will not, however, be possible for it to apply to all officers at present serving on such commissions, as this will depend on the manning situation in the various branches and ranks. All younger officers (i.e., those born in or after 1925) and older officers who are promoted will be offered the new career structure.

The extension of officers' careers to the age of 55 will tend to raise the average age of promotion, possibly two or three years, but the minimum ages of promotion will not be changed. Officers will also be promoted up to later ages than at present.

In addition to the permanent commissioned General List officers there will still be the present permanent and non-permanent commissions in the form of branch officers and officers of the Supplementary List. The retiring age of branch officers is already in most cases 55; in future it will be raised to 55 in cases where it is at present lower.

For officers on the Supplementary List a new pensionable career is being introduced under which retired pay will be earned at the age of 38 or on qualifying for pension after 16 years' service, whichever date is the later.

The recently announced pay increases for all three Services range from £73 a year for officers of the rank of Flight Lieutenant and below to £730 a year for a Marshal of the R.A.F. This represents a rise of about 8% in the junior and middle ranks to about 12% or more in the senior ranks. The basic rate for a Squadron Leader will be £1,423 per year without flying pay and £5,037 for an Air Chief Marshal.

Pay rises for the other ranks provide basic weekly increases of 7s. for corporals and below; 10s. 6d. for sergeants; and 14s. for flight sergeants and above. In addition, a new concept of trade pay, depending on a man's trade, his rank and his technical qualifications, is being introduced. Thus, a master technician, for example, can get a combined increase of up to 49s. a week and a junior technician can receive an additional 21s. Certain improved rates of pay for longer service are also being introduced.

So far as the financial affairs of the Royal Air Force are concerned, the 1960-61 Air Estimates show an increase of more than £36 million compared with those for 1959-60. The net total for the current year is, in fact, £527,460,000—which includes an allowance for the receipt of £2 million from the Federal German Government. Last year the total Air Estimate was £490,815,000.

Because of the increased expenditure on guided missiles and other armament, the gross provision for aircraft and "stores" which includes such items, is—at £259.5 million—£20.75 million more than in 1959-60. However, because less equipment is likely to be sold in the year under review, the appropriation in aid under this heading is £3.4 million less than for the previous year—so that the net increase in the Vote for aircraft and stores is £24.15 million.

Included in the 1960-61 estimates are £72.9 million for airframes, etc. (this was £69.5m. in 1959-60); £54.5m. for aero-engines, etc. (£54.0m. last year); £72.0m. for armament, ammunition and explosives (£55.85m.); and £28.45m. for radio, radar and electrical equipment (£28.5m. in 1959-60).

A sum of about £4.4m. is included this year to cover improvements in pay for R.A.F. personnel and the total Vote for pay and allowances has increased by about £3.9m., even though the total strength of the force has been reduced. Higher wage and salary levels for civilians employed by the Service has meant that the provision for these has had to be increased by some £1.4m.

Estimates for the Royal Navy

In presenting the Navy Estimates, Lord Carrington, the First Lord of the Admiralty, also added a little to the information on aircraft and associated equipment contained in the Defence White Paper. As in the case of the Air Estimates the proposed net expenditure for 1960-61 shows an increase compared with that for 1959-60—£397.5 million against £370.7 million. The increase is likewise in part due to higher rates of pay and pensions, and to greater research and development expenditure.

Lord Carrington's explanatory memorandum has something to say about the use of helicopters by the Royal Navy and refers to successful tests accomplished from a frigate with a small helicopter equipped with an anti-submarine weapon. The use of a helicopter could, he affirms, extend the killing range of a small ship and match the steadily increasing detection ranges.

According to reports following publication of the Navy Estimates, the First Sea Lord, Admiral Sir Charles Lambe, is very firmly in favour of aircraft carriers and their future. If Britain was to retain the capability of deploying military forces anywhere in the World, he is reported to have said, air support would be essential—and there were many parts of the World where such support could only come from aircraft carriers. He does not apparently subscribe to the opinion that there will be no more carriers.

Those Communications Satellites

Further comment—this time from MR. J. BLADES *and* MR. B. V. SOMES-CHARLTON *of the research department of Pye, Ltd., Cambridge—on the article "Radio-Repeater Satellites" which appeared in "The Aeroplane and Astronautics" for November 27, 1959. Other comments on the article, by* MR. G. A. ISTED, *of Marconi's Research Division, appeared in our issue for January 22.*

IN considering the problem of artificial-satellite-aided communications on Earth, it would be useful to have a final goal, representing as near as possible an ideal solution to Earth-bound communications problems. It is obviously impossible to speculate how soon such a goal could be reached or even to make a programme for its attainment, since development of precisely launching vehicles into predetermined attitudes and maintaining orbital control is only just beginning. It is possible, however, in addition to carrying out interim experiments, to discuss the target at which our efforts in this field are really aimed.

A circum-global transmission-line accessible to all nations of the World, capable of carrying the whole radio spectrum with suitable attenuation and having suitable and linear characteristics would be the sort of thing required by communications engineers. The presence of the ionosphere has been well exploited, but the limitations imposed by its unsuitable nature and the restricted frequency range of its reflecting properties make it far from ideal. Accessibility and the fact that it is already in position and available to any part of the World are its major merits. If the communications engineer could have designed the reflecting layer he would have wanted it higher and more constant in height, free from the effects of solar disturbances, and capable of reflecting the entire radio spectrum. He would have met with considerable opposition from the rest of mankind had he tried to use a "shell" encompassing the Earth so he would have been obliged to be content with relatively narrow belts arranged to cause as little obstruction as possible to the work of radio astronomers, meteorologists, etc.

As an alternative to the use of passive satellite reflectors our forward-looking communications engineers of the present time can adopt the 24-hour "repeater" satellites spaced in a pattern round the Earth and designed to receive line-of-sight transmissions from terrestrial radio stations for retransmission to other distant points on the Earth's surface. The problem of continuous transmission from repeater satellites might well be sustained over several years by recovery techniques now being developed and the launching of "stand-by" vehicles with their payloads in the event of a failure of the "space repeater" system.

Our colleagues at Marconi's may well be right about the jamming of communications satellites in wartime, but it seems to us highly unlikely that such would occur in times of peace. After all, who would wish to use a communications link for propaganda purposes? In any case, the submarine communication cable could be interrupted by enemy action as a result of a nuclear explosion in the vicinity.

It has just been announced that the Western Powers are considering the laying of a submarine cable in the Pacific at an approximate cost of £26,000,000. This appears to us as a retrograde approach by our communications engineers of the present day in view of the fact that this method may well be made obsolete by the experiments which are about to be conducted with communications satellites launched from America. It is hoped that our communications engineers will have second thoughts before it is too late.

Aviation News in General

VERTOL INTO BOEING. — The Boeing plan to acquire Vertol Aircraft Corpn. has been approved by the Vertol shareholders. This take-over becomes effective on March 31 when the company will become the Vertol Division of the Boeing Airplane Co.

SHOWING ABROAD.—Two Prospector aircraft are being taken to the forthcoming Vienna International Spring Trade Fair by Lancashire Aircraft Co., Ltd. One is equipped for agricultural duties and will be the principal exhibit in the British section of the Fair; the other is a passenger version and glider tug, and will give flying demonstrations at Vienna airport. The Fair is from March 13 to March 20.

SUPER BROUSSARDS. — Avions Max Holste has completed a survey of possible customers for the Super Broussard and reports that 17 companies in seven countries have shown an interest in or taken options on a total of 77 aircraft. Most of these companies expressed a preference for the pressurized MH262, to fly in February, 1961. An unpressurized prototype MH260, with Bastan turboprops, is to fly soon.

SKYBOLT.—It is reported that the Douglas GAM-87A Skybolt ALBM will have two solid-propellent stages, giving a range of over 1,000 miles. An astro-inertial guidance system is projected.

RYAN VZ-3 DESTROYED.—The Ryan VZ-3RY Vertiplane "vectored-slipstream" VTOL research aircraft was destroyed early this month during a test flight from the N.A.S.A. Ames Laboratory at Moffett Field. The initial flight trials by Ryan and the U.S. Army had been completed successfully. On this flight the VZ-3 pitched up and over on to its back at about 5,000 ft.; the pilot, Glen Stinnett, ejected at 1,000 ft. and was slightly injured.

TECHNICAL HELP.—The Avro company is sending a technical team to assist the Indian Air Force in the production of the Avro 748. Four members of the team, seen with Mr. S. G. Joy, the company's general manager (centre) are (left to right) Mr. W. Staniforth, Mr. E. Turner, Mr. J. Wood and Mr. H. Whittaker.

X-15 ENGINE.—The Thiokol XLR-99 "throttleable" rocket engine of 50,000 lb. s.t. has completed preliminary static tests and will shortly be installed in an X-15. Running on liquid oxygen and ammonia, the engine has performed about 11,000 restarts. A two-stage ignition chamber fires the engine at any altitude.

NUCLEAR URGE. — The Martin Company have a design study for a space propulsion system working on a series of small (0.01 kiloton) explosions. Estimates suggest that an average thrust of 800,000 lb. can be generated at the rate of one pulse per sec. with a 0.01-kiloton "bomb" immersed in liquid.

SATELLITE WING.—Operation of the Midas ICBM early-warning satellite and the Samos photo-reconnaissance satellite, it is reported, may elevate the status of the 6594th Test Wing, Ballistic Missile Division, USAF, to the first Satellite Wing.

SOLID PUNCH.—A new butadiene-based solid-propellent, being developed by North American Rocketdyne, will permit the construction of "solid" rocket engines of 2,000,000 lb. s.t.

RADIO TRACKER. — A satellite tracking station—one of 10 in different parts of the World—is to be established at Winkfield, near Windsor, as a development of the Slough Radio Research Station. Equipment supplied by NASA will be operated by members of the existing research station.

DISCOVERER X.—Fifty-six seconds after leaving the launching pad at Vandenberg on February 19, the rocket bearing the 10th Discoverer satellite developed a control fault and was destroyed in the air by the range safety officer. The satellite carried a 300-lb. re-entry capsule.

Commercial Aviation Affairs

WESTERN 720s.—An order for three Boeing 720s has been placed by Western Air Lines, with an option on one more. The order is the first for jet equipment by Western, which has a fleet of Electras in service. Deliveries will begin in April, 1961.

F.A.A./M.o.A. INTERCHANGE.—As part of an exchange programme of personnel and information between the F.A.A. and the M.o.A., Wg. Cdr. Henry I. Wood, deputy director of A.T.C. operations and Mr. W. H. Garnett, assistant chief telecommunication engineer, have been assigned to the F.A.A. National Aviation Facilities Experimental Center for two years. Two other M.o.A. specialists are also to go to NAFEC and three members of the F.A.A. Bureau of Research and Development will come to England to work particularly on trans-atlantic air navigation problems.

CAMBRIAN EXPAND.—Cambrian Airways is to buy the three 32-seat Dakotas at present hired from B.E.A., in addition to two more required for the summer programme. The company has been steadily re-establishing itself since the drastic cut-back in service which was made during 1958.

OXYGEN MASKS.—In a new ruling likely to be unpopular with flight crews, the F.A.A. will require one pilot of turbine-powered aircraft flying above 50,000 ft. to wear an oxygen mask, and all other flight crew members on duty to wear "fast-donning" masks (i.e. capable of being placed on the face and properly secured and sealed with one hand with no delay and without disturbing headphones, glasses or hats).

AIR UNION POSTPONED.—Inauguration of the first stage of Air Union was postponed from April 1 until the autumn at a meeting of the Transport Ministers of France, Germany, Italy and Belgium last week. The Ministers will meet again in Rome in May. Difficulties are said to have been encountered over the division of pooled revenues, the status of Sabena's Congo services (excluded from the original agreement) and the adoption of the Caravelle as a standard type.

NANDI OPEN.—The developed airport at Nandi, Fiji, with a two-mile runway, was opened to traffic on February 17.

BERYLLIUM MACHINING.—A general view of the new Armstrong Whitworth Aircraft's beryllium machining plant at Coventry. More about this new facility appears on page 242.

FINANCIAL RETURN.—In a reply to a written question in the Commons on February 15, the Minister of Aviation said that during the financial year 1958-59 "some £7½ million was paid to my department in respect of commercial sales of aircraft developed with Government assistance."

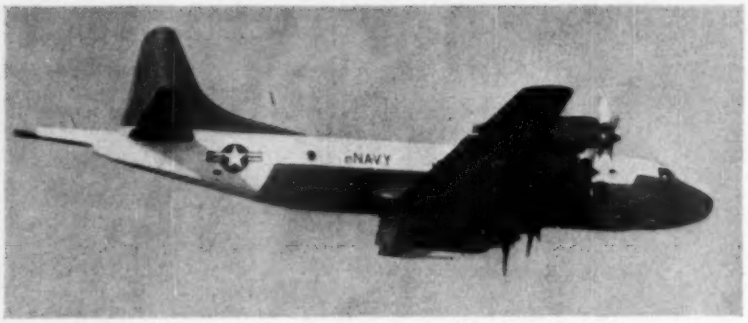
DELTA CONVAIR. — The first delivery of a Convair 880 to an airline was made on February 10 when the first of ten for Delta Air Lines was flown from San Diego to Miami in 3 hr. 32 min. at an average speed of 664 m.p.h. The sixth CV880 from the production line, it first flew on January 22. Nos. four and five are awaiting delivery to T.W.A.

GHANA PLANS.—Talks began in Accra last week between the Ghana Government and a B.O.A.C. delegation on the future of Ghana Airways, in which B.O.A.C. has a 40% interest. Ghana wishes to acquire this interest, but wants to retain the B.O.A.C. managerial staff "for any amount of years." Two Britannias will be bought or leased for the international services.

QANTAS TO ROME.—An agreement has been signed between the Australian and Italian governments, permitting Qantas to operate three services a week between Sydney and Rome via London, without restriction, and Alitalia to fly a similar reciprocal service. The agreement replaces the temporary permit under which Qantas has operated.

AEROFLOT IN IRAQ.—An agreement has been signed between Russia and Iraq whereby Aeroflot will operate air services in Iraq for four years. Twelve twin- and four-engined aircraft will be used for these services, says B.U.P.

Tu-114 NOISE TESTS.—A Tupolev Tu-114 turboprop transport, of the type which Aeroflot is expected to use on its proposed Moscow-New York service, has been undergoing noise tests at Idlewild.



FLIGHT TEST.—An operational prototype of the U.S. Navy's new P3V-1 anti-submarine patrol aircraft has completed its fifth proving flight at Lockheeds. The P3V-1 is now in production at the Corporation's California Division.

ICAO MEMBERS.—Cameroun and the Republic of Panama both became members of ICAO last week.

NATIONAL DC-8.—The first Douglas DC-8 for National Air Lines was delivered early this month. A domestic model with JT4A engines, it has 119 seats and is for service on the New York-Miami route.

C.S.A. Tu-104s.—On April 1, the Czech airline C.S.A. will inaugurate Tu-104A service between Prague and London, to match the introduction of Comets on the same route by B.E.A. At present, C.S.A. uses Czech-built Il-14s on this service.

J.A.L.-AIR FRANCE POOL.—Japan Air Lines and Air France have concluded a pooling agreement on the Polar route between Europe and Tokyo. Air France will inaugurate Boeing 707 service on April 1, and until J.A.L. introduces its DC-8s in the spring of 1961, the Air France aircraft will carry the insignia of both airlines, and J.A.L. will provide stewardesses for the service.

DC-8s FOR P.A.A.—Deliveries of the long-range intercontinental DC-8C, recently certificated by the F.A.A., have now begun, with the first aircraft going to Pan American. The airline's London office was unable to say, last week, which routes are to be flown by the DC-8C; presumably, it will be used initially on Pacific services. Pan American has 21 DC-8Cs on order (including four for Panagra).

B.E.A. DOLLARS.—During 1959, B.E.A. earned $6 million in the U.S.A. and Canada—more than the Corporation's total profit in the same period. The total was reached with tickets actually sold in North America for B.E.A. services and took no account of sales made to travellers from North America after their arrival in Europe.

COMET MISHAP.—A Comet 4 of Aerolineas Argentinas caught fire at Ezeiza Airport, Buenos Aires, on February 20, apparently as a result of a heavy landing on a training flight. The aircraft is reported to be a total loss; there were no casualties.

News About People

CHIEF TEST PILOT.—Flight Refuelling, Ltd., have appointed Mr. P. R. Hornidge as their chief test pilot. He succeeds Mr. T. Marks, D.F.C., who has joined the company's Commercial Department.

GENERAL MANAGER.— Gp. Capt. E. A. Warfield, C.B.E., D.F.C., who resigned from his appointment as director (training) with Air Service Training Ltd., last month, has been appointed general manager of the Avica Group of Companies at Hemel Hempstead with effect from February 1.

VICKERS APPOINTMENTS. — Mr. Jack Rasmussen, who was in charge of the Vickers - Armstrongs (Aircraft) Trinidad office from 1957 until the end of last year, has been appointed Customer Relations Officer at Weybridge. Mr. R. H. Botterill has been appointed to the new post of service controller at Weybridge, where he will be concerned with the after-sales service organization. Mr. J. B. Armstrong, who has been senior operations engineer, has taken up an appointment as assistant sales manager (South America). Mr. M. G. Crisp has succeeded Mr. "Joe" Leach as flight test manager at Wisley.

INTO INDUSTRY.—Southern Instruments, Ltd., have announced that Maj.-Gen. Sir William A. Scott, K.C.M.B., C.B., C.B.E., has joined their board. Sir William was until recently Director of Communications at the Foreign Office and before that was Director of Weapons and Development at the War Office.

T.A.C. CHANGES.—Following the recent appointment of Mr. C. S. Gardner as managing director, Teddington Aircraft Controls have promoted four senior staff members to form a divisional board of directors responsible for running the company's three works. This board comprises: Mr. E. J. Bush, responsible for engineering; Mr. J. Griffiths, sales; Mr. J. F. Martin, long-term development; and Mr. D. N. Steed, works and production.

CAIRO APPOINTMENT. — Mr. Michael Clapham has been appointed B.O.A.C. representative in Cairo. He will move from Delhi in April.

CANADIAN D.C.A.—Mr. Ray W. Goodwin has been appointed Canadian Director of Civil Aviation, in succession to Mr. J. R. K. Main. He joined the Department of Transport in 1946 after retiring from the R.C.A.F. with the rank of Wing Commander. In 1957 he was appointed assistant director-general of air services, and he became co-ordinator of planning and programming in 1959.

A.T.B. APPOINTMENT.—Mr. John R. Belcher has been appointed to the newly created position of director of the operation branch of Canada's Air Transport Board. He recently completed a 2½-year term as Canadian representative on the ICAO Council.

GATCO NEWS.—Mr. Arnold Field, superintendent of Southern Air Traffic Control Centre, M.o.A., has been appointed Master of the Guild of Air Traffic Control Officers. Mr. L. S. Vass, an A.T.C. supervisor at the R.A.E., has been appointed clerk in succession to Mr. G. L. Chambers. A new lodge of the Guild has been inaugurated at Prestwick.

A.W.E. CHANGES.—Recent reorganization at Armstrong Whitworth Equipment, of Hucclecote, include the appointment of Mr. A. E. Martin as resident manager, to succeed Mr. E. W. Absolon, who has resigned; he will be responsible directly to the general manager at A.W.A. Coventry.

Correspondence

"Wings Over Westminster"

WE must accept unreservedly your unfavourable comments on the presentation of our booklet (Feb. 12). However, in spite of night work, we only just beat Mr. Sandys to the post.

We are therefore rather disappointed to find that our inevitable haste has led your literary correspondent to believe that our study is a history, and to treat it as such. It was meant to be a programme for political action. We believe that a little more study would have unearthed numerous worthwhile thoughts (which indeed have not escaped other reviewers).

Are *all* your readers so knowledgeable that they can argue the pros and cons of M. Henri Bouché's approach to fifth freedom traffic? Have we overlooked prior publication elsewhere of our suggested solution to the VLF impasse? Is our criticism of the entire post-war conduct of domestic services so superficial? And our analysis of the impact of air competition on ocean passenger traffic? And is there no merit in the idea of a British Airport Authority? These are amongst the points which we feel are worthy of comment, perhaps to the exclusion of other less vital ones.

Your correspondent is incorrect in one of his criticisms. B.O.A.C. has had no Exchequer grant since 1952, and at present has a negative working capital. In other words, the Corporation owes a lot of money.

On the point of Independent costs, we attempted to present published material, telling the same story as more confidential information, to which we had access. But it is no secret that aircrew costs in the Independents are around half those in the Corporations, due to much higher utilizations, and lower rates of pay. Total maintenance costs seem to run around 70%, for the same type of aircraft. Overheads are much lower.

The bulk of the booklet was written by men professionally engaged in various sectors of the industry, and occupying positions of some responsibility. I was the only "amateur" involved. And incidentally I wrote most of the chapter on "Management and Morale" which did gain your qualified approval.

London, W.C.2. A. J. LUCKING.

Women and Children at Farnborough

YOUR editorial note headed "Women in Aviation" in your issue for February 12 mentions quite inaccurately "the long-standing S.B.A.C. veto on women guests at the non-public days at Farnborough."

The society always invites women to attend on the trade days on one essential condition—that they hold senior executive appointments in aviation; quite a number of women do, and we are very pleased to welcome them. Our "veto" applies only to women who do not satisfy this condition; for an exactly similar reason we do not invite children.

London, S.W.1 EDWARD BOWYER, (Director, S.B.A.C.).

"Southern Cross" and the Antipodean Airmail

THE information supplied by Mr. H. F. Cowley in THE AEROPLANE AND ASTRONAUTICS of December 25 last, while being accurate regarding the abortive flight of "Southern Cross" from Sydney to New Zealand, has missed one of the greatest feats of valour while in the air.

It was during the critical stages of this flight that Captain P. G. Taylor (now Sir Gordon Taylor) climbed out of the cabin, and somehow managed to draw-off oil from the "dead engine" and convey it to the other engine on the wing when it showed signs of being short of oil!!

Victoria. GP. CAPT. T. F. U. LANG.

Management and Morale

I HAVE read the comment by your contributor, Egon Murray, on the Report on Civil Aviation by the Bow Group of the Conservative Party, which comment appeared in the issue of THE AEROPLANE AND ASTRONAUTICS dated Feb. 12.

In commenting on the chapter headed Management and Morale, he says, "The greatest union activity in morale-reduction (is) that of the aircrew. Many people feel now that the pilots are trying to take gross advantage of their position." This statement is doubtless based on sensational Press comments in recent weeks in relation to discussions proceeding between the British Air Line Pilots Association and the Airways Corporations on "jet pay."

I would suggest to Mr. Murray that he would do well to bear in mind the comment contained in the last sentence of his review:—

"It requires nothing to be added except a little more knowledge."

It is clear from his comment that Mr. Murray needs to widen his knowledge considerably in relation to the aspirations and activities of the pilots before making such misleading and unwarrantable comments as that about "morale-reduction" referred to above.

Hayes, Middx. D. FOLLOWS. (General Secretary—BALPA)

Groundabout

Wrong about Wright. Cyril Uwins, Bristol Aircraft director, takes the platform next Tuesday to lecture to the Luton Branch of the R.Ae.S. on the history of aviation. Let us hope that among the audience there will be, red-faced and repentant, the *Beds & Herts Pictorial* reporter who, in his announcement of the occasion, slightly adjusted the generally accepted picture when he wrote: "Mr. Uwins has been flying since the Wright Brothers made aviation history by hopping over the Atlantic."

*

Missilaneous

One of the first effects of the English Electric-Vickers-Bristol merger has been to set idle minds speculating on the relative merits of "Thudhound" and "Blunderbird" as names for new missiles.

*

This happened to a visitor to one of our missile factories: "They're a bit hot on security here—you'd better borrow my pass. . . ."

*

Think of a number. Marcus Langley, of Tiltman Langley, Ltd., contributes an item which, although above the head of an ignorant columnist, will be appreciated, I'm sure, by all you erudite characters. He reckons that the situation of the aircraft industry may be expressed as:

$$\frac{1}{HP}\int_{BUST}^{MAKE}(SBAC).dS = \frac{1}{OO}+C$$

where:

S.B.A.C.=Society of Both Aircraft Constructors.
H.P.=H.P. (No other).
d.S.=Duncan Sandys (a small increment of).
C.=constant red tape.

*

A.I.R.O.-dynamics. Noise in our lives has now reached the pitch where a company, the Acoustical Investigation and Research Organisation, Ltd., has been set up to help soothe our noise-riddled senses. They are working on sound-proofing studies for the VC10, probably to evolve a bulkhead between the cabin and the galley which will prevent the passengers from hearing the cabin crew's opinion on having to serve 150 dinners between London and, say, Zurich.

*

Accolade. So Gp. Capt. Hamish ("It's nae bother") Mahaddie has achieved Associate Fellowship of the R.Ae.S. Hamish is one of those characters who make aviation a delightful thing to be in. A Halton boy, bomber and Pathfinder pilot, he was seconded to English Electric to help speed the Canberra into the R.A.F. and has carried out military and civil research. Now he's president of the Pathfinder Association and an established aeronautical consultant to, among others, Inferation, Ltd., whose anti-icing elements are used in the Comet, and Arusha Industries, who make many things, including equipment for aircraft and missiles. But what I especially like is this evidence of the Society's continuing appreciation of the value of recruiting practical airmen-technicians to their strength.

*

The MOA we are together. "I hear that Mr. Sandys is going around singing 'I'm putting all my egg-beaters in one basket.'"

by Gyrene

Personal Flying

AN interesting visitor which it is hoped will arrive for the W. S. Shackleton sales week-end at Kidlington on May 6-8 is the attractive little Polish PZL-102 Kos two-seat light aeroplane. The Polish aircraft industry has established an excellent international reputation with its advanced sailplanes, and the Kos looks like upholding this in the powered aircraft field.

It is of all-metal construction with full anti-corrosive protection, and the side-by-side cockpit has a sliding bubble-type canopy and dual controls. It is powered by a 90-b.h.p. Continental C-90-12F engine, with starter and generator, and is exceptionally well equipped. Intended for touring or training, it is semi-aerobatic, with a maximum speed of 123 m.p.h. and a cruising speed of 108 m.p.h. Its range is 388 miles and gross weight 1,388 lb.

The Kos is being made available for sale in this country by Norco Engineering, Ltd., of Burgess Hill, Sussex, and its U.K. delivered price, including duty, is expected to be about £2,460. This includes a complete set of engine, airframe and cockpit covers, together with spares for the initial major overhaul, and such items as chocks, screw pickets and so on.

Accompanying the Kos will be the PZL-101 agricultural aircraft, which is basically the Russian Yakovlev Yak-12M light four-seater. It has been extensively modified by the Polish company, with swept and clipped wings, plus the necessary spraying and dusting equipment. It is powered by the 260-b.h.p. AI-14R radial engine and has a gross weight of 3,549 lb. Production is proceeding in Poland alongside that of the Yak-12.

POLISH IMMIGRANT.—The PZL-102 Kos two-seat all metal light aeroplane is a prospective participant in the Shackleton Sales week-end at Kidlington in May. U.K. agents are Norco Engineering Ltd.

* * *

Long-distance flights in light aircraft have ceased to become major news items, but occasional epics come to light which deserve to be recorded. Such a trip was recently made from Brussels to the Belgian Congo in an A.T.L. Prentice by M. Marcel Druet, and warrants mention not so much for the distance flown, as the circumstances attending it.

When M. Druet took delivery of the Prentice at Southend, a week before his departure from Brussels, he had a total of 140 hours on Austers and Piper aircraft. He set off from Grimbergen on September 30 last with his wife and four children, aged 2-6 years, and enough baggage and personal effects to bring the Prentice, OO-CDR, about 350 lb. over its maximum gross weight. The route flown was along the coastlines of Europe and Africa, and for the desert stretches, the Prentice was 390 lb. overweight.

This seemed to make very little difference to its performance and the Belgian family arrived safely after an adventurous flight through patches of very bad weather, on October 12. The total distance flown was about 6,800 miles in 58 hr. 23 min. flying time. Approximately 735 gal. of fuel was consumed, and 41 gal. of oil.

Gliding Notes

by Dr. A. E. Slater

THIS year's thermal soaring began on Feb. 5 when Nicholas Goodhart, taking a launch at Lasham so as to test the instruments in the Olympia 419 which he will fly in the World Championships, contacted lift and climbed to over 9,000 ft. inside a cumulus cloud, staying up for 2½ hours. On the way down, he came out of the cloud directly above the launching point, which was then bombarded with pieces of ice falling from his wings.

Two days later, thermal flights were made at Oxford and Hornchurch, but in quite a different air mass. Goodhart's air came from the west, its ultimate source being Greenland, so it was warmed considerably at the bottom during its journey to England. On the 7th, however, the air followed a weak cold front from the east; its surface layer had been well below freezing point in Holland, but the southern North Sea is at about 40° F. at this season and must have helped to destroy the air's stability.

* * *

THE year's first pilots to acquire all three Diamonds to add to their Gold "C" badges are Edwin Leemann, of South Africa, and Tony Goodhart of Great Britain. Their numbers in the international list are 140 and 141 respectively. During 1959, 28 new names were added to the list.

Poland now leads in the possessors of "three Diamonds" with 48, and France follows closely with 45. Then come the United States with 15, Germany 10, Czechoslovakia 6, Yugoslavia 5; Great Britain, South Africa, Switzerland and Argentina have 2 each, and New Zealand, Holland, Austria and Hungary 1 each. The other South African is E. Dommisse with No. 108, and New Zealand has G. A. Hookings with No. 88. Nicholas Goodhart has No. 42.

The latest international list gives the date of each Diamond flight for each pilot, with the latest of the three in heavy type—i.e. the one which the pilot presumably found the most difficult. This makes it easy to count them, and the result (excluding Leemann) is that 86 completed the 500-km. distance last, 47 the 5,000-m. gain of height, and only seven the 300-km. goal flight. The last figure is not surprising, as the "goal Diamond" is usually the first of the three to be acquired, by declaring a goal before setting out for Gold "C" distance.

A fourth Diamond is suggested by John Holder in a letter to the February *Sailplane and Gliding*: he proposes a speed of at least 70 km.p.h. round a 300-km. triangular course. This is 43½ m.p.h.—a difficult figure to remember; it might be better to give a time, such as four hours, rather than a speed, as the metric fans have not yet turned their attention to our clocks. Anyway, it is an excellent idea to introduce something new instead of just multiplying the conditions for some previous badge by less than two.

* * *

RECENT concessions, in the view of the F.A.I. Gliding Commission, which allow Silver "C" 50-km. distance flights to be made round a triangular course, and Gold and Diamond 300-km. and 500-km. flights to be made over a dog-leg course, have rendered these feats too easy, and it has asked the national Aero Clubs to agree to cancel these concessions.

* * *

PORTSMOUTH Naval Gliding Club's chief instructor, "Buster" Burgess, took a launch in the club's Grunau at 14.40 hrs. on January 31 at Lee-on-Solent, and surprisingly contacted lift of 2 ft./sec. over the coast for about half a mile towards Southampton. He stayed in the lift for 45 minutes and reached 1,300 ft., and was later joined by a Skylark 2 flown by Cdr. Humphry Dimock, who stayed up for 25 minutes until the lift gave out.

The Solent is four miles wide, not only at this point, but for another 4 miles to the W.N.W. as far as Calshot, while to the E.S.E. it narrows to two and a half miles at Spithead. This is not much of a source for a sea breeze, and anyway no thermals for pulling the breeze in were reported to landward of the lift; they would, if present, have been limited by a strong inversion at 3,800 ft.

The best theory I can suggest is that the two sea channels, which approach Southampton Water from each side of the Isle of Wight, acted like valleys in partially diverting the general southerly wind, so that the two air streams impinged on each other at the place where the lift was found. This is borne out by wind reports at 12.00 hrs.: S. by W. at Hurn (to the west), and S. by E. at Thorney Island (to the east). The lift disappeared, Capt. O. C. Harris reports, when the wind backed 45 deg. This was a general effect, not local, for it happened also inland at Boscombe Down. It would then, of course, no longer have been diverted by the Solent, and the convergence effect would disappear.

Industry Record

Aircraft Electrical Equipment

British Standard G.100—"General Requirements for Aircraft Electrical Equipment"—is being revised by the British Standards Institution to take account of the requirements of modern high-performance aircraft operation; it has also been modified in the light of experience of working to the provisions of the first edition, which was published in 1952.

To be produced in five parts, it will provide the basis of approval by the A.R.B. of electrical and other equipment for civil aircraft. Drafts of the revised standard are now being circulated for technical comment to industry and copies can be obtained from the Institution, 2 Park Street, London, W.1.

It is not intended that the new standard should be applied retrospectively. Existing equipment will remain in use for some time, and the matching of new equipment with old systems, and vice-versa, will obviously need consideration.

Titles of the five parts are: "Declarations, identifications and construction"; "Environmental and operating conditions"; "Characteristics of electrical power systems and equipment"; "Instruments and indicators"; and "Rotating electrical machines."

A High-altitude Move

The Hymatic Engineering Co., Ltd., has developed and type tested two personal equipment connectors for use during movement by bomber crew members who normally remain in one place. Developed under a M.o.A. contract in co-operation with R.A.E. and the Institute of Aviation Medicine, these connectors comprise one unit with a single plug-in action for all connections between the crew member and aircraft.

When moving from one position in the aircraft to another, he unplugs his portion of the multi-services connector by means of a release lever, plugs it into a transfer lead to provide limited oxygen and electrical supplies and then, after moving, transfers it to the aircraft portion of the connection serving the new crew position. The connector for the static seat position is known as the MSC3, and the transfer lead personal equipment connector is the MSC5.

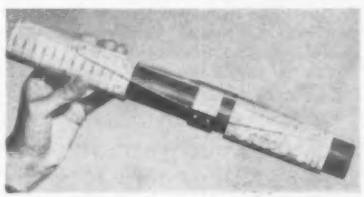
The MSC3 consists of two sub-assemblies, the man portion which is attached to relevant portions of the crew member's flying clothing, and the aircraft portion which is attached to the static seat, or some other part of the aircraft structure. The man portion carries flexible anti-kink hose connections for the oxygen and air ventilated suit services and a group of butting contacts for the mic/tel, visor and expiratory-valve electrical heating services.

An inward breathing valve in the oxygen connection enables the crew member to breathe cabin air up to 8,000 ft. when not connected to the main oxygen supply. It allows breathing from the atmosphere if the emergency oxygen supply is exhausted during an emergency escape, and safeguards the man's life if he is still unconscious when his emergency oxygen supply is exhausted.

A self-sealing valve prevents loss of pressure from the pressure clothing (which is fed from the main emergency oxygen supply when cabin pressurization has failed) during transfer from one crew position to another. Similarly, pressure is retained in the man's flying suit if he abandons the aircraft above a breathable altitude and when the clothing must still be pressurized.

The ventilated suit connection on the man portion is rotatable and detachable, so that it can be passed through holes in the flying clothing. This allows the ventilated suit to be removed from the rest of the flying clothing when the man takes off his flying suit.

The MSC5 transfer lead connects the mic/tel, visor and expiratory-valve electrical heating services and the oxygen supply, but not the air for the man's ventilated suit. As already stated, this service is dispensed with for the short time taken in the transfer of positions.



A new slide rule developed and patented by de Havilland Aircraft of Canada for determining aircraft weight and balance. The calculator, which is cylindrical, provides a direct reading of weight, C.G., and moment index at any stage of loading of an aircraft.

Technical Authorship

This spring will see the culmination of a long period of educational planning activity by the Technical Publications Association, through the formulation by the City and Guilds of London Institute, of a syllabus for technical authorship. The programme, which started over four years ago with the initiation of a syllabus covering technical illustration, is thus fulfilled. As a token of its continued interest in these examinations, the Association will make an annual award to the top candidate in each subject.

The Association has now been in active operation for some seven years, and covers the twin subjects of technical authorship and illustration. Principal objects of the Association are to promote the advancement and improvement of technical publications techniques by the interchange of knowledge and information; to promote and maintain a recognized status for its members: and to provide a centre from which information and advice may be obtained by all interested persons.

Its membership is at present just under 300 and activities throughout this country are sponsored by area groups in London and the provinces; overseas there are members in both the Commonwealth and the U.S.A. Activities promoted by the groups include lectures and the presentation of papers on a wide variety of subjects and the formulation of professional standards.

The most valuable single order yet placed with Teleflex Products Ltd., for aircraft components is for cable tension regulators for use in the Vickers VC 10. Approximately 40 regulators are required for each aircraft.

Barrelling Machines

A new range of barrelling machines developed by Rolls-Royce, Ltd., for small batch work is now being marketed by Roto-Finish, Ltd., of Hemel Hempstead. There are three models—the 6/12, 9/12 and 12/24—in the range, with six, nine and 12 basic drum units respectively.

These machines are designed to be

On February 11 Air Cdre. C. M. Wight-Boycott, Director of Logistics (Forecasting and Planning), visited the Gloster Aircraft Co., at Hucclecote, Gloucester. Seen in the structural research department are (left to right) Sqn. Ldr. L. C. Gregory, R.A.F. liaison officer at Moreton Valence, Mr. J. S. Louch, Mr. J. F. Cuss, Mr. E. W. Shambrook, Air Cdre. Wight-Boycott, Mr. H. W. Sidwell and Mr. G. Worrall.

Industry Record . . . .

This gyro instrument test table, designed by Bryans Aeroequipment Ltd., in collaboration with Vickers-Armstrongs (Aircraft), Ltd., for use on a VC 10 flying control proving rig, is the latest addition to the company's range of tables. Capable of movement in three planes, it is remotely driven and controlled from the console on the right.

completely self-contained. The barrels are of plastic construction, and each barrel has a capacity of approximately ½ cu. ft. Each machine has a number of vibrating screens, chip bins (the number varying according to the model of the machine), a sink for washing and a tablet drawer for housing special tablet-form compounds for use in processing.

Compounds in tablet form is another Rolls-Royce/Roto-Finish development and these are also being marketed by Roto-Finish.

Separate time-switches for each barrel control processing, and at the end of the time cycle the cradle holding the appropriate barrel falls forward, indicating that processing is complete. By selection on a dial wheel the chips are returned after processing to the correct container.

Nickel Alloy Show

For the second consecutive year Henry Wiggin and Co., Ltd., is staging in London an exhibition of its nickel alloys. To be held at Park Lane House from March 21 to 25, it is aimed at helping engineers and designers to make the best use of the specialized alloys manufactured by the company.

These alloys fall mainly into four groups: corrosion-resisting alloys, heat-resisting alloys, electrical resistance alloys, and materials with special properties. The display will include a large selection of actual components, sub-assemblies, and finished parts in which Wiggin materials are employed.

During the exhibition a series of lectures will be given on subjects including "Fabricating the High-Nickel Alloys," and a series on the uses of high-nickel and nickel-base alloys in the production of nuclear power, in heat-resisting application and in the electrical and electronic industries.

Third I.E.A. Exhibition

This year's Instruments, Electronics and Automation Exhibition is to be held at Olympia, London, between May 23-28, inclusive. To be twice the size of the two previous shows in terms of floor area and number of exhibitors, it will represent nearly 500 companies, including 100 from overseas.

Hand Stabilizer

Helicopter Sales, Ltd., of London, are marketing in this country and abroad a hand held stabilizer for use with optical equipment to eliminate vibration in aircraft and other moving vehicles. Comprising two gyroscopes mounted in spring restrained gimbals, it is recommended for use with cameras, binoculars and sextants up to 7 lb. in weight.

Fitted with a standard tripod mount attaching screw and weighing approximately 20 oz., the stabilizer requires 115V, 400 c.p.s. AC supply.

Marconi at L.A.P.

A new service depot has been opened by Marconi's Wireless Telegraph Co., Ltd., at London Airport to replace the temporary one previously in use. The new depot, which is in the No. 1 Maintenance Area, is considerably larger than its predecessor and can handle a much wider range of work with greater speed. The engineer-in-charge is Mr. J. W. Grandey and the depot is in Sections A and B, Building 201.

Aviation Calendar

February 29

Yeovil.—R.Ae.S. Yeovil Branch 5th Henson and Stringfellow Memorial lecture, "VTOL Aircraft," by D. Keith-Lucas at Park School, Park Road, at 19.30 hrs.

March 1

Luton.—R.Ae.S. Luton Branch historical lecture, by C. F. Uwins in the Lecture Hall, Luton College of Technology, at 19.00 hrs.

Salford.—Royal Technical College lecture, "Space Navigation Systems," by P. R. Wyke, at the Royal Technical College, at 19.00 hrs.

March 2

Hull.—R.Ae.S. Brough Branch lecture; "The Boeing 707," by J. Sutter at the Royal Station Hotel, at 19.30 hrs.

Paris.—R.Ae.S. Thirteenth Louis Blériot Memorial lecture, "Current Problems in Aero Engine Design,' by Dr. E. S. Moult at 9 Bis Avenue d'Iena, at 17.00 hrs.

Preston.—R.Ae.S. Preston Branch lecture, "The Fairey Rotodyne," by Dr. G. S. Hislop at the R.A.F.A. Hall, at 19.30 hrs.

Swindon.—R.Ae.S. Swindon Branch lecture, "Flight Testing of Modern Prototype Aircraft," by C. F. Bethwaite, at the College, Victoria Road, at 19.30 hrs.

Weybridge.—R.Ae.S. Branch discussion on "Space Flight," at the Apprentice Training School, Vickers-Armstrongs (Aircraft), Ltd., at 18.10 hrs.

March 4

Cheltenham.—The British Institution of Radio Engineers South Midlands Section lecture, "The Use of Radio Aids in the Control of Modern Transport Aircraft," by K. Fearnside, at the North Gloucestershire Technical College, at 19.00 hrs.

Feltham.—R.Ae.S. London Airport Branch Film Show followed by annual dinner, at the Feltham Hotel, at 19.00 hrs.

London.—R.Ae.S. Rotorcraft Section lecture, "British Research on Aerodynamics of Powered Lift Systems," by J. Williams in the Library, 4 Hamilton Place, W.1, at 18.00 hrs.

March 5

London.—British Interplanetary Society Symposium, "The Exploration of the Moon," in the Lancaster Room, Caxton Hall, S.W.1, at 14.30 hrs.

New Patents

APPLICATIONS ACCEPTED

832,181.—**Vickers-Armstrongs (Aircraft), Ltd.**—"Aeroplanes."—Feb. 17, 1954 (Mar. 3, 1953).

832,394.—**Sperry Gyroscope Co., Ltd.**—"Helicopter rotor speed control system."—June 23, 1958 (June 27, 1957).

831,978.—**Miles, Ltd., F. G., and Miles G. H.**—"Aircraft for use as a bomber."—Nov. 8, 1957 (Aug. 8, 1956).

831,845.—**C. M. Ernst.**—"Toy aircraft."—Dec. 23, 1957 (Dec. 10, 1957).

Printed specifications of the above will be available on April 6, 1960, and the opposition period will expire on July 6, 1960.

Company Notices

NEW COMPANIES

Eastern Air Terminal, Ltd. (648,230).—Private co. Reg. January 29. Cap. £100 in £1 shs. Objects: To carry on the business of tourist, travel and entertainment agents; to provide air and other terminals, etc. Directors: John A. Alderson, 56 Thames Drive, Leigh-on-Sea, Essex; Anthony J. C. Pike, 22 Nassau Road, S.W.13. Sec.: J. A. Alderson. Solrs.: J. P. Nolan and Janes, Southend-on-Sea. Reg. off.: Eastern National Coach Station, Euston Square, N.W.1.

Liverpool Security Delivery Co., Ltd. (648,383).—Private co. Reg. February 1. Cap. £5,000 in £1 shs. Objects: To carry on the business of collecting, conveying, transporting and delivering by land, sea or air and safeguarding and safekeeping of bullion, precious metals, etc. Directors: Leslie R. G. Smith, 43 Lingmell Road, Liverpool, 12; Joseph C. Kelly, 145 Blackmoor Drive, Liverpool, 12; Francis J. Kelly, John E. Holdsworth, James G. Clark and John T. Pattinson. Sec.: J. T. Pattinson. Reg. off.: Lombard Chambers, Ormond Street, Liverpool, 3.

Ship and Cargo (Salvage), Ltd. (648,398).—Private co. Reg. February 1. Cap. £300,000 in £1 shs. Objects: To carry on the business of salvage contractors, salvors, salvage-shipowners, ship and aircraft owners. Subscribers (each with one share): Sir Wm. G. Espley, Bt., 53 Leadenhall St., E.C.3, and Jas. Huntly, "Corina," 21a Morcombe Rd., Branksome Park, Bournemouth. First directors are to be appointed by the subscribers. Solrs.: Middleton, Lewis and Co., 92 Fenchurch St., E.C.3. Reg. off.: 53 Leadenhall St., E.C.3.

Aircraft Air Spares, Ltd. (648,414).—Private co. Reg. February 1. Cap. £100 in £1 shs. Objects: To establish and operate air transport and ancillary and cognate services, etc. Directors: Thomas D. Keegan and Wendela O. Keegan, both of Ashton House, Steeple Ashton, Trowbridge, Wilts. Solrs.: H. Maxwell Lewis, Southend.

D.G. Light Engineering, Ltd. (648,478).—Private co. Reg. February 2. Cap. £1,000 in £1 shs. Objects: To carry on the business of mechanical, electrical, constructional, heating, motor, aeronautical and general engineers. Subscribers (each with one share): W. E. Luke, Appletrees, Devenish Road, Sunningdale, Berks; Walter Miller, 7 Newlands Park, Newlands, Glasgow, S.3. First directors are to be appointed by the subscribers. Solrs.: McKenna and Co., 12 Whitehall, S.W.1. Reg. off.: 11 Grosvenor Street, W.1.

Personal Notices

BIRTHS

Cownie.—On February 12, at 40, Sherwood Avenue, St. Albans, to Jill, wife of Jim Cownie of THE AEROPLANE AND ASTRONAUTICS—a son.

Cunningham.—On February 12, at R.A.F. Hospital, Akrotiri, Cyprus, to Margaret Ray (*née* Cavaghan), wife of Wg. Cdr. A. J. Cunningham—a daughter.

Fanning.—On February 15, at P.M.R.A.F. Hospital, Halton, to Lilian (*née* Pride), wife of Sqn. Ldr. Michael Fanning, M.B., B.S.—a daughter.

Jones.—On February 13, at Farley House, Farnborough, to Midge, wife of Sqn. Ldr. J. D. Jones—a daughter.

McDonald.—On February 9, at Oakham Memorial Hospital, to Frances, wife of Plt. Off. S. G. McDonald—a daughter.

Price.—On February 15, at Stepping Hill Hospital, to Diana, wife of Flt. Lt. Nigel Price—a son.

MARRIAGE

Harris—Shore.—On February 13, at St. Paul the Apostle, Akrotiri, Cyprus, Flg. Off. Michael F. Harris, R.A.F., to Janet Ross Shore.

DEATHS

Barron.—On February 15, at Tascroft Court, Warminster, Sqn. Ldr. Leslie Barron (Retd.).

Hereford.—On February 10, at Ryecrest, Bedford, Wg. Cdr. Ernest Herbert Hereford.

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AGAINST AIR ATTACK AS IN NATURE

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NOTICES

MINISTRY OF AVIATION.

CIVIL AIRCRAFT ACCIDENT INVESTIGATION PROCEDURE.

THE Committee set up by the Minister of Aviation, under the Chairmanship of Sir David Cairns, Q.C., to review the civil aircraft accident investigation procedure, and the conditions under which the licences of flight crew or maintenance engineers may be cancelled or suspended, is willing to consider written evidence from anyone wishing to comment. Memoranda should be sent to Mr. E. J. Martin, Ministry of Aviation, Room 3000C, Berkeley Square House, London, W.1, from whom copies of the terms of reference of the Committee may be obtained if required. 523-3

AIR TRANSPORT ADVISORY COUNCIL.

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FROM SILVER CITY AIRWAYS, LTD., of 62 BROMPTON ROAD, LONDON, S.W.3:—

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FROM EAST ANGLIAN FLYING SERVICES, LTD., of Southend Airport, Essex:—

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These applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. 523-8

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